INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 76 APRIL, 1943 NUMBER 4

SPECIAL CONTRIBUTION

A GENERAL CONSIDERATION OF METALS FOR BURIED APPLIANCES IN SURGERY

CHARLES S. VENABLE, M.D., F.A.C.S., and WALTER G. STUCK, M.D., F.A.C.S.,
San Antonio, Texas

"... *And yielding metal flow'd to human form ...*"—*Pope.*

As modern surgery has developed, repeated efforts have been made to fashion metal appliances that could serve in the internal fixation of fractures, in the ligation of vessels, and in the support of soft tissues, as well as for other uses when rigidity was found to be necessary.

Despite unhappy experiences, numerous experiments have finally led to an understanding of the requirements for new metals and alloys so that metallurgical advances can now be adapted to surgery with a reduction of the risks of complications. The story of this development roughly coincides with the evolution of metals from the native Damascus steel, famed for its tensile strength and toughness, through the crude bronzes, copper, and wrought iron, to the complex and multitudinous alloys which are being manufactured at the present time.

FIRST USES OF METALS

Petronius, one of the earliest surgeons to propose the use of metals, in 1565 devised a gold plate for the repair of defects of the cleft palate. Lapeyode and Sicre, in 1775, were the first to place metal wire about a fracture. Kearny Rodgers of New York, in 1826, proposed the use of silver wire in fractures, but in those pre-Listerian days he recommended that the ends of the wires should protrude from the wound to facilitate their removal. Of course, failure often attended these early surgical efforts because infection invariably followed, and the delayed healing of the wounds was accepted as a natural consequence. Yet as early as 1844 doubts began to arise as to the suitability of metals in the body tissues, for Pancoast warned, "Wire suture should not be used in fractures as they cause bone necrosis" (53).

In 1840, Malgaigne described his fracture hooks. In 1878, von Langenbeck (44a) was the first to insert a metal nail into a fractured hip, and Lister (45), in 1883, reported the successful wiring of a patella. Soon after Lister, Estes in 1887 proposed the use of steel plates in fractures; J. W. White in 1892 described his removable bone plate (Fig. 1); Murphy in 1892, his famous metal button for intestinal suture (51); Thiriar in 1894, an aluminum plate; Lane in 1897, his silvered steel screws; Streinach in 1900, the silver plate; Payr in 1901, his magnesium tubes for arterial anastomosis; and Lambotte in 1902, the brass plates. From 1905 onward great interest was directed toward the use of buried metal appliances in fractures by the reports of Lane on the use of screws, silver wire, and staples in the treatment of fractures (41, 42, 43).

From the first, however, surgeons observed that most metals were poorly tolerated by the body and they endeavored to explain this on the basis of natural toxicity of the metal or the unfavorable reaction of the tissues to foreign bodies. Experimental investigations of this problem began as early as 1829 when Levert undertook the study of

Presented before the Kanawha County (West Virginia) Medical Society, October 13, 1942.

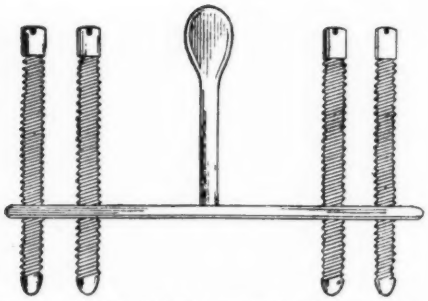

Fig. 1. Sinclair White's removable bone plates and screws. Since these always caused drainage and loosening of the appliance, the screws and handle on the plate were left protruding from the wound (79).

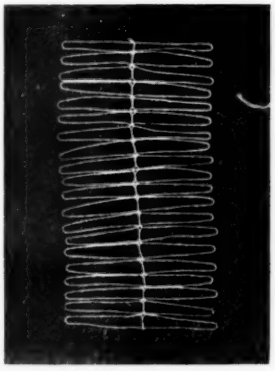

Fig. 2. Willard Bartlett's silver-wire filigree which was sewed into defects in the abdominal wall (5).

the reactions of tissues to metals and he was followed by a number of experimenters such as von Baeyer (3a), Lambotte, and Hey-Groves (32). All the more popular alloys and metals were investigated and used clinically, although the most common were gold, silver, and platinum. Of these, silver was most widely used since it was relatively inexpensive and was believed to possess antiseptic properties in the body.

EARLY UNSUCCESSFUL METALS

Of the various metals which were first tried it is worth while to mention a few of the most popular.

Silver, which has already been mentioned, enjoyed a great vogue for many years because of its purity, ease of handling, and relative freedom from unfavorable reactions. It was advocated for splints of the jaw by Sinclair White (79), for wire to hold fractured bones by Lejars, for the repair of ventral hernias by Willard Bartlett (5) (Fig. 2), and for bone plates by Halstead (30). The faults of silver which eventually led to its abandonment were its softness, its tendency to break under stress, and its rapid oxidation in the body fluids. Even though the material used was a basic metal about 90 per cent pure, failure resulted because of unfavorable tissue reactions and the consequent interference with wound healing.

Aluminum, first separated in 1828 and known for its strength and lightness, was made into various surgical appliances. In 1893, Booth and Curtis placed an aluminum plate in a defect in the skull (8), Lejars used aluminum wire in fractures, Elsberg (25) devised an aluminum cylinder to be placed about a fractured bone, Watson Cheyne and Burghard tried a perforated aluminum cylinder for fractures, Halstead used aluminum clips to occlude large vessels, and Harrington and Gould devised a segmented aluminum ring for intestinal anastomosis (Fig. 3). However, aluminum also failed since it caused much irritation of the tissues and disturbances of the adjacent structures, while the metal itself disintegrated in the body fluids.

Magnesium was proposed for many uses in surgery since it is a metal which was found to be absorbed in the body. We have already mentioned Payr's (54) magnesium rings for end-to-end anastomosis of arteries (1901) (Fig. 4). Huse (34) in 1878 tried magnesium-wire sutures, Andrews (2) in 1917 used magnesium clips for the ligation of blood vessels, Seelig (59) in 1924 again tried magnesium wire sutures, and McBride (46) in 1938 recommended magnesium plates and screws in fractures. Magnesium, which is now commonly known as Dowmetal, is one third lighter than aluminum and has many industrial uses. In body fluids, however, it is rapidly oxidized and disintegrated. This was formerly believed to be a virtue since the appliance would not require removal, but now it is known that this intense electrochemical activity causes widespread destruction of bone and adjacent tissues while the metal is being absorbed.

Brass, carbon steel, nickel-plated steel, and many other metals and alloys have been tried, but in each case irritation of the tissues, delayed healing, pain, swelling, and sinus formation have resulted. These phenomena, formerly attributed to infection, pressure necrosis, or foreign-body reaction, are now known to be due to intense electrolytic reactions caused by the effects of the body fluids on the dissimilar metals contained in the alloy.

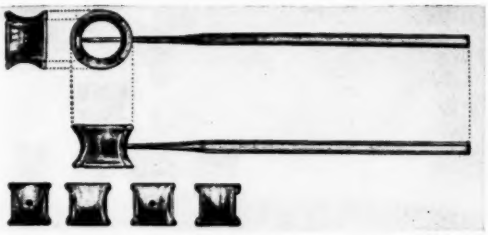

Fig. 3. Harrington and Gould's segmented aluminum ring which was used for intestinal anastomosis. The segments were supposed to become eroded and separated so that they passed through the intestine.

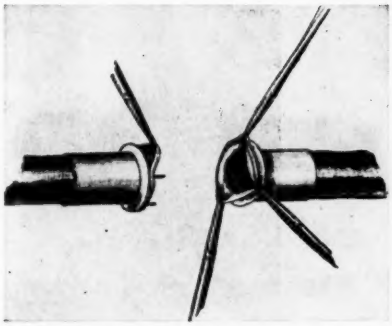

Fig. 4. Payr's magnesium rings for arterial anastomosis. They were supposed to be absorbed in the body after they had served their purpose (54).

THE INFLUENCE OF LANE

In spite of former failures, in the years between 1905 and 1920 there was a great revival of interest in the use of metals because of Lane, who reported his success with plates of "strong steel" (41, 42, 43). Moreover, his reports were upheld in this country by Sherman (60), who recommended the use of plates and screws of vanadium steel. Yet once more surgeons were disappointed because even with these new steel alloys there was again the common observation that when these plates were used, there were many failures, with "sterile abscesses," nonunions, and chronic draining sinuses. The routine use of buried metal appliances in the body again fell into disfavor, and catgut, kangaroo tendon, fascia lata, beef bone, or removable metal screws were recommended in their place.

Since 1920 there have been many experiments and reports on the effects of metals on the tissues, and surgeons have endeavored to find a suitable alloy which will have no deleterious effects in the body (9, 10, 15, 21, 36, 38, 46, 80). Studies have been made of the toxicity of metals in tissue cultures, the corrosion and weight loss of buried metal appliances in the body, and the histological changes in tissues adjacent to metals. The conclusions of the various observers have been contradictory and there has been no unity of opinion on the causes of unfavorable reactions about such metal appliances.

ELECTROLYSIS OF METALS

The possibility of electrolytic activity about metals in the body has been mentioned by several observers but again the deductions were not uniform (21, 26, 52). In 1936, we performed a number of animal and chemical experiments in which we found definite evidence that *all the metals commonly used in surgery were subject to electrolytic activity in body fluids* (66, 70, 71, 72, 73, 74, 75, 76, 77). Moreover, we found that *the extent of tissue damage was roughly equivalent to the amount of galvanic action which took place between the metals.* This essentially new concept seemed to explain the disparity among previous experimenters and to serve as a guide in the search for a suitable metal for use in the body. In the course of the experiments we came upon a dental alloy, vitallium, which we found to be completely inert in body fluids and, consequently, nonirritating to tissue. In September, 1936, we placed the first vitallium screws in a clinical case and, after other studies, felt justified in recommending the use of vitallium for surgical appliances. It is now widely used in many fields of surgery as nails, screws, and plates in bone surgery, as a material for testicular implants in urology, for orbital implants after enucleation of the eye, for tubes in the common bile duct after stricture, for colostomies, for skull plates, to restore joints, and for numerous other appliances (Figs. 5, 6, 7, 8). The reason it has stood the test of experience by many surgeons is because it is inert or electropassive in normal body fluids and therefore causes no galvanic action with the resulting unfavorable tissue changes.

MODERN ALLOYS

As new industrial alloys have been developed and tried as buried surgical appliances in the body, it has been found that they succeeded only if they were passive or free of electroactivity in normal human serum. Three such materials are under investigation at Columbia University for the Fracture Committee of the American College of Surgeons. They are vitallium, tantalum, and "18-8-SMO" stainless steel. The standards of suitability of any metals or alloys are based on the amount of electroactivity which can be dem-

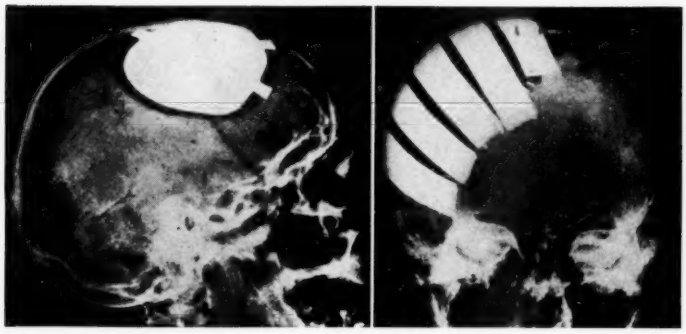

Fig. 5, Left, Geib's moulded vitallium plate used to fill a defect in the skull (27).
Fig. 6. Beck's vitallium strips for the repair of defects in the skull (6).

onstrated when the metal is placed in physiological saline solution.

For instance, when ordinary metals are placed in normal saline solution at body temperature, there is discoloration of the fluid in a few weeks and an accumulation of sediment. This means that electrolytic activity about the metal is sufficient to cause erosion of the material itself. Even when no apparent sediment accumulates, chemical analysis of the fluid reveals evidence of metallic salts in solution in the supernatant fluid. It is this electrolytic activity between the various metals in the alloy which causes unfavorable tissue reactions and interference with healing.

Of the modern metals which have been used and which have failed because they were not passive in the body, the better known are chrome steel, vanadium steel, plated steel, and the many different forms of "stainless steels" or "rustless steels."

Chrome steel, a popular industrial alloy several years ago, was an admixture of iron and chromium which was moderately resistant to oxidation. In body fluids, however, there was marked electrolytic activity between the ions of iron and the ions of chromium, and this caused intense irritation of the tissues about appliances of this material.

Vanadium steel, because it is a useful alloy in industry, was adapted to bone surgery, and standard plates and screws of it were widely recommended. Unfortunately for the surgeons, there are many vanadium steels (chrome-nickel vanadium, carbon-vanadium, silicon-vanadium, and others) so that surgical houses offered numerous "vanadium steel" appliances of different alloys with no understanding of the intense electroactivity between the constituent metals of the alloy.

Sherman, who popularized vanadium steel, was supplied with a high-grade product and therefore his results were better than those of the surgeons who bought "vanadium steel" at random. The average surgeon purchased "vanadium steel" from a catalogue with no knowledge of its constituents or of its electroactivity in the body. Hence, many secured poor alloys and their results with them were unhappy. Recently Sherman has discarded vanadium steel because of its electrolytic activity in the body and now recommends the new "18-8-SMO" stainless steel.

Steel appliances plated with nickel, silver, or copper were often offered by the instrument houses because they were supposed to possess the strength of steel with the corrosion resistance of the plating metal. These appliances generally caused the most severe reactions of all. The plating became cracked or chipped so that two dissimilar metals were side by side in the body fluids. There was much electroactivity in these "batteries" and tissue damage and bone necrosis inevitably followed. Although it was commonly observed, the electrolytic action was not ordinarily recognized as such.

Stainless steel ("V2A," "Staybryte," "18-8") was developed by the Krupp Company of Essen in 1920. It was a chrome steel to which nickel was added to give greater corrosion resistance. It was first produced in this country in 1926 as a modified cheap weather-resistant steel. Although there were many industrial formulas, the commonest type was the "18-8" steel which contained 18 per cent chromium, 8 per cent nickel, and the remainder iron or steel. This alloy when used for surgical appliances caused much less tissue reaction than previous iron and steel alloys although nails still came loose, tissues were irritated, and the metal was eroded. It has been

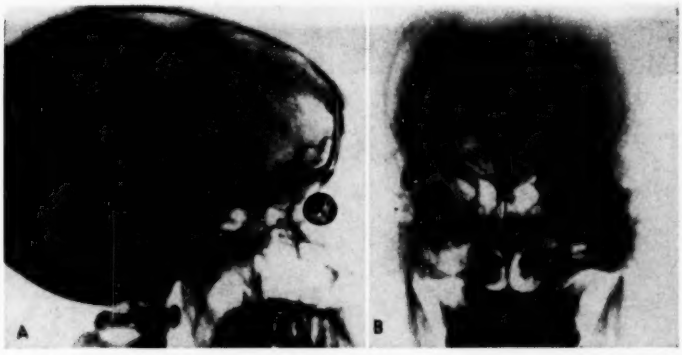

Fig. 7. Doherty's vitallium implant in the eye socket to restore the cosmetic outlines and to support an artificial eye (23).

found that "18-8" stainless steel is subject to "pit corrosion" in body fluids, which means that the electrolytic activity between the ions of irons, chromium, and nickel is enough to destroy the body cells nearby and to cause disintegration of the metal. A great disadvantage of stainless steel is that there are scores of alloys of this general type which vary in composition and in electrolytic activity in the body. The individual surgeon cannot determine which alloys are suitable and which are electroactive since he buys "stainless steel" or "rustless steel" or "18-8 stainless steel" from a catalogue with no other guide than the recommendations of a salesman who may or may not be advocating an alloy which is highly injurious to tissue.

PASSIVE METALS

Now that we have made it clear that the suitability of a metal for use in the body depends upon its passivity in body fluids, other new alloys as they are developed can be studied from this standpoint. So far, we know of only three metals which are sufficiently passive for use in the body, vitallium, tantalum, and "18-8-SMO" stainless steel, and of these vitallium is the only one which appears to be uniformly inert.

Vitallium is an alloy of cobalt, chromium, and molybdenum which was developed by the Austenal Laboratories of New York for dental plates. It contains no iron and is entirely resistant to body fluids. There is no corrosion of the metal itself or irritation of the tissues about it. We encountered it in our experiments on the effects of electrolysis of metals on bone in 1936, and because of its inertness we advocated its use for bone plates and screws. The material is cast and is very hard, yet as it is now alloyed it can be bent to fit irregular surfaces. In 1941, we reported its use in 1,227 cases with failures due to faults of the metal in only 0.17 per cent. Since this study, vitallium appliances have been used successfully in more than twice as many other cases. The faults of vitallium are its inability to be worked cold or to be drawn into wire, and the fact that all plates, screws, nails must be cast.

"18-8-SMO" stainless steel is a new industrial alloy which contains roughly 18 per cent nickel, 8 per cent chromium, 2 to 3 per cent molybdenum, and the remainder iron, manganese, and carbon. Molybdenum has been commercially available only since 1918 when a mine was opened at Climax, Colorado. The addition of molybdenum to "18-8" stainless steel alters the grain structure and makes for easier machining. Moreover, just as the addition of nickel to the early chrome steels gave greater corrosion resistance, so the adding of molybdenum to "18-8" stainless steel made for a more homogeneous alloy with less "pit corrosion" or electrolytic activity about it. However, there still is some electrolytic disintegration of the metal in normal saline solution (which can be demonstrated by chemical analysis of the solution), and this is accompanied by some tissue irritation. "18-8-SMO" stainless steel can be machined, it has high tensile strength, and it can be drawn into wire. The disadvantage of using it in the body is that there is a slow steady galvanic action which over a long period of time produces tissue irritation.

Tantalum, which is a basic element, was discovered by Eckeberg in Sweden in 1802. Because of the difficulties in isolating it, its discoverer named it after the hapless son of Zeus. It is strong, tough, and malleable, and can be drawn into wire or machined. It was first produced in

Fig. 8. Kimball and Drummond's nasal splint of vitallium to correct "saddle nose" deformity (39).

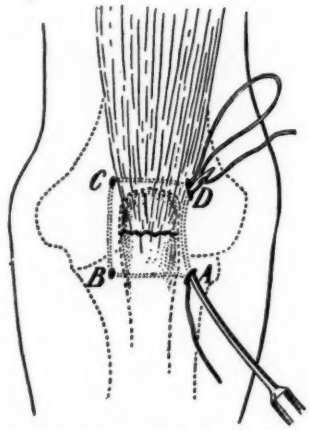

Fig. 9. Murphy's method for repairing a fractured olecranon with stovepipe wire (51).

the Pilbarra district of western Australia in 1922, but is now mined in the Black Hills of South Dakota. It was examined experimentally and used clinically by Burch and Carney at Vanderbilt University and by Burke of Canada (11, 12, 83). They found it to be inert in body tissues, which would be expected since there can be no electrolytic activity about a single basic metal. A disadvantage of tantalum is the extreme difficulty of extracting it. It cannot be cast, so thus far it has been generally available only as wire and skull plates, but there is promise that plates and screws can later be made of this element.

The ideal alloy or metal to be used in surgery would be one as ductile and as tough as stainless steel and yet as inert or electropassive in body fluids as vitallium or tantalum. Indeed, metals face a severe test in the body. They are left for indefinite periods of time in a complex biological solution that is kept at a temperature which facilitates chemical interactions. It is obvious from our discussion that a vast number of metals have failed to meet the requirements imposed by these conditions. Too often metals have been used because they were adaptable in industry rather than because they were nonelectrolytic in body fluids.

The strength of buried appliances is only moderately important because plates and screws on bones merely support the fragments while the healing process takes place and the extremity is meanwhile protected by a cast or splint. Since wires, plates, and screws can be made to any size, any desired strength can be attained.

The size of appliances is vastly important as electrolytic activity is directly proportional to the area exposed to the body fluids. A small wire of almost any alloy would cause little reaction, but a Smith-Petersen nail or metal skull plate would cause severe tissue damage unless it was passive in the body and free of chemical corrosion. In practice only vitallium has been found suitable for large metal appliances which can safely be left in the body for an indefinite period.

The finish on metal appliances likewise affects the electrolytic activity. Stainless steel wire is annealed, heat-treated, or dipped in acid in the attempt to attain a smooth surface free of pits. Large metal appliances of steel are similarly treated in nitric acid or are highly polished in the attempt to reduce the electrolytic activity. On the other hand, vitallium and tantalum, which are inert passive metals, cause no reaction whether rough or smooth.

WIRE SUTURE

The special problem of wires for sutures of the skin or for the fixation of bones is unique because very small quantities of metal are generally used. As in other aspects of this problem, many different metals have been suggested for wires in the body. Murphy (Fig. 9) in 1906 advocated simple stovepipe wire; Babcock (2a) in 1928 suggested aluminum bronze wire. He also advised the use of annealed steel wire "although it oxidizes in the tissues." In 1934 (3) he recommended alloy steel wire. Sinclair White (79) in 1909, stout silver wire, Rodgers in 1826, silver wire; Moore in 1864, gold and platinum wire; Huse

(34) in 1878, magnesium wire; and Seelig (59) in 1924, magnesium wire. Of course, none of these materials would be suitable in the body for large plates, nails, or screws because sufficient electrolytic activity would take place about them to destroy the tissue cells. Even as small wire they create some erosion of bone, although there is very little electroactivity and they are fairly well tolerated by the soft tissues. The new tantalum wire is, of course, inert in any body fluids and is therefore ideally suited to surgical application. "18-8-SMO" stainless steel wire has many advantages over the old "alloy steels" or "annealed steels," but its principal virtue is the reduction of the amount of electroactivity in the tissues.

SUMMARY

The whole question of suitability of metals for use in the body can be stated briefly as follows:

There are many occasions in surgery when a buried appliance made of metal is highly desirable.

Until very recently, all the metals and alloys which had been used were capable of producing unfavorable tissue reactions in the body.

Now it is known that an essential of any metal for use in the body is passivity or freedom from electroactivity in the body fluids.

Only three materials generally available seem to possess sufficient passivity to be used safely in the body: "18-8-SMO" stainless steel, which is relatively inert and can be adapted for small appliances such as wire or screws; tantalum, which is inert and will be useful when production problems are solved; and vitallium, which is inert, has been used widely, and has been found to be perfectly safe for any type of appliance, except wire, which requires malleability strength and the essential biochemical resistance.

As new alloys are developed some material which is inexpensive, strong, malleable, and free of corrosion in body fluids will undoubtedly be discovered. If there is no electrolytic activity about it, it will meet all the requirements of metals in surgery. Also, it will meet the standards of passivity which have been established by the Fracture Committee of the American College of Surgeons, which standards serve as a guide for subsequent developments of metals for use in surgery.

BIBLIOGRAPHY

1. Albee, F., and Preston, R. L. J. Internat. Coll. Surgeons, 1941, 4: 289.
2. Andrews, E. W. J. Am. M. Ass., 1917, 69: 278.
2a. Babcock, W. W. A Textbook of Surgery. Philadelphia: W. B. Saunders Company, 1928.
3. Idem. J. Am. M. Ass., 1934, 102: 1756.
3a. Baeyer, H. von. Beitr. klin. Chir., 1908, 58: 1.
4. Baker, L. D., and Waters, C. H. Arch. Surg., 1942, 44: 531.
5. Bartlett, W. Ann. Surg., 1903, 38: 47.
6. Beck, C. S. J. Am. M. Ass., 1942, 118: 798.
7. Bell, R. H. Mil. Surgeon, 1942, 91: 185.
8. Booth, J. A., and Curtis, B. F. Ann. Surg., 1899, 17: 127.
9. Bothe, R. T., Beaton, L. E., and Davenport, H. A. Surg. Gyn. Obst., 1940, 71: 598.
10. Bothe, R. T., and Davenport, H. A. Surg. Gyn. Obst., 1942, 74: 231.
11. Bunnell, S. Am. J. Surg., 1940, 47: 502.
12. Burch, J. C. Proc. Soc. Exp. Biol., N.Y. (In Press)
13. Burke, G. L. Canad. M. Ass. J., 1940, 43: 125.
14. Burman, M. S. Bull. Hosp. Joint Dis., N.Y., 1940, 1: 79.
15. Campbell, E., Meirowsky, A., and Hyde, G. Ann. Surg., 1941, 114: 472.
16. Campbell, W. C. J. Ind. M. Ass., 1939, 32: 679.
17. Idem. J. Iowa M. Soc., 1939, 29: 591.
18. Campbell, W. C., and Boyd, H. B. Am. J. Surg., 1941, 51: 748.
19. Campbell, W. C., and Speed, J. S. Ann. Surg., 1939, 110: 119.
20. Carruthers, F. W. South. M. J., 1941, 34: 1223.
21. Cretin and Pouyanne. Bordeaux chir., 1933, 4: 321.
22. Cuthbert-Wallace. Lancet, Lond., 1915, 1: 1022.
23. Doherty, W. B. Am. J. Ophth., 1939, 22: 239.
24. Idem. Arch. Ophth.. 1941, 25: 637.
25. Elsberg, C. A. Med. News, N. Y., 1905, 85: 683.
26. Galfré. Soc. phys. hist. Nat. Genève; 47–1930.
27. Geib, F. W. J. Am. M. Ass., 1941, 117: 8.
28. Girsdansky, J., and Newman, H. F. Am. J. Surg., 1941, 53: 514.
29. Haas, W. Arch. orthop. Unfallchir., 1936, 37: 606.
30. Halstead, W. Bull. Johns Hopkins Hosp., 1905, 16: 346.
31. Hatfield, W. Trans. Brit. Inst. Surg. Technicians 1–1936.
32. Hey-Groves, E. W. H. Brit. J. Surg., 1913, 1: 438.
33. Hopkins, H. H., and Zuck, F. N. Med. Bull. Veterans Admin., 1938, 15: 1.
34. Huse, E. C. Chicago Med. Examiner, 1878 (August).
35. Icart. J. méd. chir., Par., 1775.
36. Jones, L., and Lieberman, A. B. Arch. Surg., 1936, 32: 990.
37. Jones, P. Surg. Gyn. Obst., 1941, 72: 1056.
38. Key, J. A. Arch. Surg., 1941, 43: 615.
39. Kimball, G. H., and Drummond, N. R. J. Oklahoma M. Ass., 1941, 34: 9.
40. Kurtz, A. D., and Horwitz, M. T. Arch. Surg., 1936, 33: 630.
41. Lane, W. A. Brit. M. J., 1905, 2: 1325.
42. Idem. Lancet, Lond., 1905.
43. Idem. Practitioner, Lond., 1910, 85: 610.
44. Lange, M. Zschr. orthop. Chir., 1926, 47: 520.
44a. Langenbeck, von. Verh. Deut. Ges. Chir., 1878, 7: 92.
45. Lister, J. Brit. M. J., 1883, 2: 855.
46. McBride, E. D. J. Am. M. Ass., 1938, 3: 2464.
47. Menegaux, G., Moyse, P., and Odiette, D. Presse méd., 1934, 42: 658.
48. Merrick, A. W. Cobalt-Chrome Alloys in Prosthetic Dentistry, 1939.
49. Mitchell, W. M. Metals and Alloys, 1940.
50. Mumford, E. Surg. Gyn. Obst., 1934, 58: 194.
51. Murphy, J. B. Med. News, 1892, 42: 665.
52. Orsos, E. Zbl. Chir., 1925, 52: 1014.
53. Pancoast. Operative Surgery. Philadelphia, 1844.
54. Payr, E. Arch. klin. Chir., 1901, 64: 726.

55. PEARSE, H. E. Surgery, 1941, 10: 37.
56. Idem. Ann. Surg., 1942, 115: 1031.
57. PEYTON and HALL. Surgery, 1941, 10: 711.
58. PRESTON, D. J. Surgery, 1941, 9: 896.
59. SEELIG, M. G. Arch. Surg., 1924, 8: 669.
60. SHERMAN, W. O. Surg., Gyn. Obst., 1912, 14: 629.
61. Idem. Arch. Surg., 1940, 40: 838.
62. SMITH, T. E. Texas J. M., 1941, 37: 241.
63. SMITH-PETERSEN, M. N. J. Bone Surg., 1939, 21: 269.
64. SPEED, K. Surg. Gyn. Obst., 1941, 73: 845.
65. STROCK, A. E. Am. J. Orthodont., 1939, 25: 467.
66. STUCK, W. G. J. Bone Surg., 1937, 19: 1077.
67. SWANSON, J. C. J. Lancet, 1941, 61: 228.
68. TUELL, J. Northwest M., 1940, 39: 163.
69. UHLIG, H. H., and WULFF, J. Met. Tech., 1939.
70. VENABLE, C. S. South. M. J., 1938, 31: 501.
71. VENABLE, C. S., and STUCK, W. G. J. Ind. M. Ass., 1938, 31: 335.
72. Idem. J. Am. M. Ass., 1938, 111: 1349.
73. Idem. Surg. Gyn. Obst., 1940, 70: 964.
74. Idem. Am. J. Surg., 1941, 51: 757.
75. Idem. South Surgeon, 1941, 10: 234.
76. Idem. Ann. Surg., 1941, 114: 309.
77. VENABLE, C. S., STUCK, W. G., and BEACH, A. Ann. Surg., 1937, 105: 917.
78. WALTER, M. Aero Digest, 1940.
79. WHITE, S. Brit. M. J., 1909, 2: 1525.
80. ZIEROLD, A. A. Arch. Surg., 1924, 9: 364.
81. Dowmetal, Industry's Lightest Structural Metal. Dow Chemical Company, 1940.
82. Machining Hard Alloy Steels. Steel, 1940 (May 27).
83. The Metal Tantalum. Fansteel Metallurgical Corporation. 1939 (December).
84. Nickel Cast Iron News, 1942, First Quarter, 13: 1.
85. Vanadium Steels and Irons. Vanadium Corporation of America.
86. The Working of S.A.E. Nickel Alloy Steels. Am. Machinist, 1939 (October 18).

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Munro, D.: The Bacteriology of the Wounds of Compound Fractures of the Skull. *N. England J. M.*, 1942, 227: 939.

Munro's clinical experience with compound fractures of the skull has been that infections are minimal in the first forty-eight hours after injury. The policy, therefore, has been to postpone for forty-eight hours any procedures, such as débridement, until they could safely be made complete, and without precipitating or aggravating shock. To lend support to these principles, studies of swab cultures of the wounds were made in 70 cases of various types of compound fractures. The organisms recovered are listed in a table under the headings of simple compound fractures; compound fractures involving paranasal sinuses, without and with rhinorrhea; bullet wounds; and perforating wounds.

Fifty-six swab cultures were made of 52 patients. Pathogenic bacteria were grown from 38, or 67 per cent of these cultures. The author admits the inadequacy of swab cultures by stating that he does not believe that the cultures which showed no growth signified that the wounds from which they were taken were sterile. There was no doubt that all the wounds contained bacteria. However, the contamination was so slight in many that the swab did not come in contact with any of the contaminants.

The staphylococcus aureus alone or in mixed culture was grown from 34 swabs (60.7 per cent); the hemolytic streptococcus in pure or in mixed culture from 8 (14.2 per cent); the pneumococcus from 3 (5 per cent), and the meningococcus and the escherichia coli each from 1 culture. Eleven swabs (20 per cent) yielded no growth and from 7 (14.2 per cent) the staphylococcus albus only was grown.

Organisms were grown from 55 per cent of the wounds cultured within the first twenty-four hours after injury, and from 66 per cent within forty-eight hours after infection. Of the later cultures 91 per cent gave growths. The author believes that many of the organisms recovered from later cultures were deposited after the injury rather than at the time of its infliction and, furthermore, that compound wounds of the skull do not differ bacteriologically from wounds of other parts of the body. Minimum handling at the time of first dressing and until com plete débridement is advocated. If this principle is adhered to, Munro believes that infection can be prevented by proper débridement carried out at any time within the first forty-eight hours after infliction of the wound, provided the patient is safely out of surgical shock and in a properly equipped and staffed hospital. EDWIN J. PULASKI, M.D.

Mock, H. E., and Mock, H. E., Jr.: The Management of Skull Fractures and Brain Injuries. *J. Am. M. Ass.*, 1942, 120: 498.

The authors made a nationwide survey of the management of 6,544 skull fractures from the records of 50 hospitals and 100 surgeons. To this were added 487 cases of their own. They divided their records to cover a period from 1928 to 1935 and one from 1935 to 1940. The latter period showed a reduction of 7 per cent in the mortality rate. Motor-driven vehicles were responsible for 50 per cent of these fractures, falls for 26.8 per cent, and blows for 10.3 per cent. The widespread distribution of this trauma and the fact that from 47 to 64 per cent of the deaths occur within the first twenty-four hours makes the management of such cases always the problem of the general physician and surgeon.

The observance of rules and indications for the management of brain injuries will, in the authors' opinion, reduce the higher mortality rates from 25 to 50 per cent. The most dangerous period is the first six hours. The rules for this period are:

1. Transfer the patient from stretcher to bed, place the patient between blankets, and apply heat.
2. Roentgenograph every head injury, but never in the presence of cerebral shock.
3. Do nothing which adds insult to injury, such as suturing scalp wounds, or reducing associated fractures.
4. Do not transfer the patient from a ward or to another hospital.
5. Avoid oversedation. Do not give morphine; morphine masks the picture and adds to respiratory depression.
6. Stimulate if necessary, but do not depend on stimulants and sedation as the sole treatment.
7. Dextrose (50 cc. of 50 per cent solution given intravenously) is the best means of restoring blood volume in shock. An additional 200 to 300 cc. of isotonic sodium chloride should be used, if indicated. Overcoming the shock, not the dehydration, is the sole purpose here.
8. Blood plasma or blood transfusion should be used if shock is profound, or if hemorrhage from associated injuries is present.
9. Oxygen will tide many a patient over this dangerous period.
10. Postural drainage or the use of an aspirator is always indicated when the air passages are obstructed.
11. Antitetanus, antigas, and other preventive serums may add additional insult. Use these serums after the six-hour period is over.
12. Watch and record the pulse, respirations, and blood pressure every thirty minutes to one hour,

and the temperature every one to two hours; observe changes in the pupils and reflexes, and watch for focal signs.

After six hours, conservation of the patient's strength and maintenance of fluid balance should be added to these rules. The authors are convinced of the value of dehydration by means of hypertonic carbohydrates given intravenously and magnesium sulphate given by rectum, and of adequate spinal drainage when indicated, not used haphazardly and routinely. A certain percentage of depressed fractures have a large blood clot beneath them and when signs and symptoms indicate the need, these must be operated on early; rarely is the operation necessary earlier than the first twelve to twenty-four hours. The remaining depressed fractures can wait a period of days or weeks before operation is performed.

MARIAN BARNES, M.D.

Denny-Brown, D.: The Sequelae of War Head Injuries. *N. England J. M.*, 1942, 227: 771.

In this article Denny-Brown discusses the assessment and treatment of prolonged sequelae of head injuries. The large numbers of possible factors causing failure to return to duty following reasonable convalescence from head injury (six weeks was the arbitrary time adopted) may be resolved into two chief categories—organic and pyschoneurotic. It is essential to assess these factors accurately, for their treatment and disposal differ greatly. Complete data, including follow-up, have already been collected on well over 1,200 cases. Of the last 400 patients with unduly delayed convalescence, 38 had suffered gunshot wounds of the head, 13 injuries to the head in aircraft crashes, 303 head injuries from other trauma (motorcycle, tanks) and 46 had recurrence of symptoms from head injuries sustained before the war. Of these 400 men, 22 had traumatic epilepsy, 116 had other organic defects, and 262 suffered solely or chiefly from psychoneurosis.

Traumatic epilepsy is thoroughly discussed. Attention is directed to its rather high incidence, to the fact that it is a complication of localized destruction and scarring of cerebral tissue, its serious disabling features, and the fact that epilepsy occurring within the first four weeks after injury has an excellent prognosis.

Of the other consequences of structural damage to the brain, hemiplegia, paraplegia, hemianopia, and dysphasic-dyspraxic disorders are obviously serious disabilities. Cases of fracture into sinuses, of retained foreign bodies, and of jaw, facial, or ophthalmic involvement require careful study.

Prominent in the sequelae of head injury are headache, vertigo, difficulty in concentration, insomnia, with or without depression. This whole group, variously described as the "postconcussion syndrome," "post-traumatic general cerebral syndrome," and "minor contusion syndrome," is by far, in the author's opinion, the most common syndrome arising from craniocerebral injuries.

On the basis of his studies Denny-Brown points out that the peculiar mixture of trauma and emotional shock that constitutes all war (and most civil) head injuries retains traces of both features throughout the convalescent period. Too frequently, emphasis is laid wholly on either the structural damage or the psychoneurotic state, with consequent failure to achieve the best results from treatment of both. Although particularly evident to the trained neurologist by reason of his familiarity with both functional and organic nerve disorders, the proportions of the mixture should be evident to anyone who takes time to sum up the pretraumatic nervous constitution and personality, the severity of the general brain injury, the residual intellectual and physical state, and the nature and degree of persistent anxiety. It is from lack of appreciation of such factors that disappointment in the results of treatment arises. It is maintained that intensive effort along these lines not only will conserve and rapidly restore officers and men the services can ill afford to lose, to duty, but also will substantially reduce the great bulk of persistent disability that became a national calamity after at least one previous war.

The diagnostic and prognostic limitations of abnormalities in air encephalograms and electroencephalograms are discussed, and the important conclusion is reached that some persistent defects are compatible with recovery without any disability. It is maintained that the key to most organic disability is defective intellectual function. No single test will demonstrate a hopeless prognosis.

J. M. MORA, M.D.

Adams, W. M.: Internal Wiring Fixation of Facial Fractures. *Surgery*, 1942, 12: 523.

In the author's opinion, the multiplicity of extraoral appliances devised for the treatment of facial fractures shows that treatment by this means is not entirely satisfactory. The author has treated 85 fractures of the maxilla in the past eight years, and during the past two years has fixed the fractured parts by wiring them to the neighboring unfractured bony structures in all cases in which immobilization was required. There were only 3 exceptions and in these open reduction was contraindicated and extraoral appliances were used. In the presence of infection, open reduction is definitely contraindicated; however, an extraoral device may be required for temporary immobilization only, and after the infection subsides one may remove the appliance and wire the fragments together.

Since the maxilla is the foundation structure, accurate apposition and immobilization of a fracture in this region is of prime importance. Once this is accomplished, immobilization of the secondary fracture offers little difficulty. In a simple bilateral fracture of the maxilla, a small incision is made over the infraorbital ridge on either side; a hole of sufficient size to accommodate a No. 25 or 26 stainless steel wire is bored through the infraorbital ridge. The wire is then threaded through the opening,

looped over the ridge, and both ends are passed together along the anterior wall of the antrum into the upper sulcus over the second molar teeth, where they are caught with a hemostat. The fractured bone is elevated to its normal position, and the wires are drawn taut and fixed to one or more of the teeth. In edentulous patients, the wires may be united over the hard palate in the midline, the alveolar ridge being protected by molded dental wax. In comminuted fractures of the infraorbital ridge, the major fragment may be immobilized by wiring it to the outer portion of the infraorbital ridge, antral packing being unnecessary.

For reduction and immobilization of fractures of the maxilla with associated fractures of the zygoma or malar process, an incision is made over the ridge of the frontal bone, lateral to the supraorbital rim and just above the zygomatic-frontal suture line. Through drill holes, wires connect the frontal and malar bones on the temporal side.

Following the reduction and immobilization of fractures of the maxilla and other facial bones, associated fractures of the nasal bones are reduced and maintained in position with a nasal splint.

In bilateral horizontal fractures of the maxilla with separation in the midline, the two halves are drawn together and immobilized with arch bands or wires. This should precede open reduction and fixation of the maxilla to the unfractured bones.

The wires are allowed to remain in place for from three to nine weeks, according to the location and type of fracture.

The author describes in detail the management of three cases, and photographs accompany the article. LOUIS T. BYARS, M.D.

Smith, F.: Some Refinements in Reconstructive Surgery of the Face. *J. Am. M. Ass.*, 1942, 120: 352.

The plastic surgeon in the present war has a solemn obligation to the soldier, as well as to the casualty victim in civil life, to return him to society in a condition which will permit him to take his place without prejudice.

The plastic surgical experience of the last war was a stimulus to better reconstruction. It contributed several important new methods which revolutionized plastic procedure. Among these was the "tubing" of the pedicle of a flap, the rotated flaps of forehead skin for repair of the nose, eyelid, or cheek, and the use of free skin grafts. The results with these methods are more functional than cosmetic. However, the surgeon has a dual responsibility, to restore to normal, or as near to normal as possible, both function and appearance. The latter precludes any plan of repair which adds a single unnecessary scar or foreign tissue to any visible portion of the body. His major thought should be directed toward a better, more acceptable final appearance. He should realize that the end-results of pedicled flaps, rotated forehead flaps, and free skin grafts are such that they should never be considered procedures of choice for facial repair, because a transplanted skin flap never matches and blends with its surroundings. When these are the only procedures available, the planning should contemplate the ultimate replacement of the transplanted skin with normal skin from the vicinity.

Two important and essential principles of repair were ignored or given scant attention during the last war and have received little more consideration since. I refer to the Z plastic procedure and multiple excision. Z plastic has been discussed in the literature occasionally. It has had wide employment as a method of correcting scar contractures, but numerous other possibilities of its usefulness, both alone and in combination with other principles, appear to be unappreciated. "Multiple excision" by repeated procedures at proper intervals is possible because the skin subsequently returns to its normal tension and elasticity.

The employment of the principles of Z plastic, multiple excision, and interpolated flaps from the vicinity of the defect should have first consideration in the planning of a correction. The methods in common practice today should be employed with the intention of removing ultimately the transplanted skin covering whenever possible.

The author presents typical results of the current methods of repair for contrast with the results obtained by utilization of Z plastics, multiple excisions, and interpolated flaps. BRADFORD CANNON, M.D.

Pelner, L.: Parotid-Duct Obstruction without Calculus. A Suggestion for Treatment. *Am. J. Digest. Dis.*, 1942, 9: 417.

Salivary-duct obstruction occurs most frequently without calculi, the latter occurring relatively seldom. Opinions quoted in the literature state that obstruction is usually due to a plug of fibrin or thick mucus in the ducts. Although the secretion from the parotid gland is serous, the presence of a mild infection results in a collection of heavy mucus or fibrin which causes retention and recurrent pain in and swelling of the gland. The plug may be discharged or released by manipulation followed by relief. A secretory neurosis is also a possible etiology. Calculus is excluded by means of x-rays or bimanual manipulation, while cysts, tumors, Mikulicz disease, and other inflammatory conditions are to be differentiated. The history of remissions is characteristic.

Since salivation is increased by stimulation of the parasympathetic nervous system, the author used this method to promote salivary secretion and dislodge the obstruction. One cubic centimeter of prostigmine methylsulfate 1/2000 was given hypodermically in 3 cases of parotitis during an attack with a resulting profuse flow of thin secretion in from twenty-five to thirty minutes. In 1 case a thick mucoid secretion came from the duct. A fourth case evacuated a thick mucoid secretion spontaneously, which was followed by a profuse thin secretion.

The same therapy might help evacuate very small calculi, but it is not recommended in the presence of

a large calculus. In certain cases the necessity for probing the duct might be obviated by this treatment.

JOHN R. LINDSAY, M.D.

EYE

Tiffin, J., and Kuhn, H. S.: Color Discrimination in Industry. *Arch. Ophth.*, Chic., 1942, 28: 851.

The authors report the results of their survey of color discrimination in 7,000 industrial employees in a sheet mill. Their survey revealed that (1) color vision is important for certain industrial jobs that have not been identified previously as requiring color vision; (2) color vision is reduced with increasing age so that it is important to determine that an applicant for a position has an excess of color vision ability before he is accepted for training and employment; and (3) an individual could not simply be classified as having "normal color vision" or being "color blind", as color vision exists on a continuous scale ranging from color blindness to keen color sensitivity.

For this survey several tests were used among which was a simple four-item red-green color discrimination test on which the results were based primarily. The most difficult item in the test was passed by 55.3 per cent of the employees. Those who failed (44.7 per cent) were not considered color blind. They simply had less ability to discriminate colors.

It was found also that at every age level the group of employees who had been rated high in job performance contained a definitely large percentage of employees who passed the color vision test, in spite of the fact that not over 5 per cent of the jobs involved were previously considered as requiring color vision. The industrial inference is that it is possible that color vision may serve as a barometer of the general physical condition of employees.

The survey also revealed that 74 per cent of the employees between the ages of twenty and twenty-five but only thirty-two per cent above the age of fifty-five passed the color vision test.

JOSHUA ZUCKERMAN, M.D.

Gulliver, F. D.: Particles of Steel Within the Globe of the Eye. Cause, Diagnosis, Prevention, Technique of Removal, and Results. *Arch. Ophth.*, Chic., 1942, 28: 896.

The author discusses the causes, diagnosis, prevention, technique of removal, and postoperative results of intraocular particles of steel. He points out that (1) 98 per cent of more than 1,800 intraocular foreign bodies in his series of cases were composed of steel; (2) a large number of them were particles which flew off the heads of steel hammers, steel drills, and the mushroomed edges of cold chisels; (3) the entrance wound was through the cornea in 80 per cent of the cases, the foreign particles lodging in the anterior chamber in 85 per cent of cases; (4) roentgen-ray examination should be performed in all cases which present a history of injury sustained while striking steel with a hammer; (5) accidents can be prevented by avoiding the use of defective tools with overhanging edges and by the wearing of nonbreakable glasses and protective shields; and (6) in all cases the particle should be removed through the anterior route except when the entrance wound is in the sclera and is large enough to permit withdrawal of the foreign particle through it, when the foreign body is surrounded by an inflammatory exudate, or when it is imbedded in the chorioid or the sclera so that it cannot be drawn by the magnet into the anterior chamber.

The operative procedure is as follows:

a. If the particle is in the anterior chamber it may be withdrawn through the corneal wound unless the wound is in the pupillary area of the cornea. In most cases, after full dilatation of the pupil, the particle is drawn into the pupillary area and the magnet is manipulated so that the particle is brought to rest upon the anterior surface of the iris between the upper margin of the cornea and the upper margin of the pupil. The particle may then be removed through a keratome incision.

b. If the particle is in the vitreous or in the coats of the eyeball the giant magnet is applied at about 15 or 20 cm. from the apex of the cornea, at which distance unnecessary trauma to the iris or ciliary body can be avoided in drawing the foreign body around the lens into the pupillary area of the anterior chamber. If no reaction occurs the magnet is brought closer to the cornea. When the current is applied reaction of the particle to the magnet is manifested by sudden pain, a pulling sensation, or the appearance of the particle in the anterior chamber or behind the iris. If a reaction occurs the foreign particle can always be drawn into the anterior chamber. Absence of reaction of the particle after intermittent application of the magnet for a period of five or ten minutes directly over the site of the foreign body may indicate that the foreign body is in the orbit, in the sclera, surrounded by an inflammatory exudate, or that it is only slightly magnetic. If a reaction is absent on the first day that the magnet is applied, it should be applied for eight or nine succeeding days. If a reaction still fails to occur another roentgenogram should be taken to determine whether the foreign body has been displaced from its original site. If the particle has not been moved and is still within the eyeball or within the sclera, the sclera may have to be incised. In most cases (80 to 90 per cent) in which the initial injury has not resulted in irreparable damage or severe inflammation, the sight of the eye is not seriously impaired if removal is properly performed.

JOSHUA ZUCKERMAN, M.D.

Spaeth, E. B.: The Removal of Metallic Foreign Bodies from the Eyeball and from the Orbit. *J. Am. M. Ass.*, 1942, 120: 659.

Two problems are involved in the disposal of metallic foreign bodies in the globe or orbit: (1) the diagnosis of the presence, character, and exact position of the foreign body, and (2) the exact surgical

procedure to be employed in its removal. The greatest single diagnostic aid is the x-rays. In certain cases stereoscopic plates may prove helpful, while in others single-plane exposures at different angles may be of greatest value. These differences are illustrated by several cases. In cases in which doubt remains as to the foreign body's being within the globe, air may be injected into Tenon's capsule and roentgenograms again taken and studied. Radiopaque fixed corneal and scleral landmarks may be employed and are helpful in making exact measurements for the surgical removal of nonmagnetic foreign particles. Iodized poppyseed oil can be floated behind a Koeppe contact glass to give accurate localization for foreign bodies in the anterior segment of the eye.

The biplane fluoroscope has two general applications in the removal of foreign bodies from the globe and orbit. It is of undoubted value in the removal of retrobulbar, deeply imbedded, radiopaque foreign bodies. After careful and deliberate dissection the patient is moved into the fluoroscopic room and the substance is removed under the fluoroscope, the patient being returned to the operating room for resuturing of the muscles, and dressing. The second application is in the removal of intraocular, radiopaque nonmagnetic foreign bodies when the foreign body is not in or attached to the retina and when there is considerable hemorrhage or exudate in the vitreous precluding the use of the endoscope. This method is fraught with considerable danger, however, because of possible disorganization of the retina, chorioid, or lens. Great care must be exercised in the use of the forceps through a sclerotomy incision.

For magnetic foreign bodies both the giant magnet and the hand magnet are useful. The former is most valuable when a diffuse and variable magnetic field is required, whereas the hand magnet is useful only when the tip can be applied directly to the foreign body or no more than 2 mm. from it. The anterior route of extraction is preferable for smaller particles, the transcleral route for larger bodies. All things being equal the anterior route is the best. Sclerotomy incisions and points of entrance should be rimmed with diathermy needles to guard against a later retinal detachment.

The endoscope is useful in removing nonmagnetic foreign bodies not incarcerated when the vitreous is clear. Forceps should be devised to fit individual cases. Localization with the ophthalmoscope may be sufficient. Considerable practice is necessary for satisfactory use of the endoscope.

WILLIAM A. MANN, M.D.

O'Brien, C. S., and Allen, J. H.: Ocular Changes in Young Diabetic Patients. *J. Am. M. Ass.*, 1942, 120: 190.

The authors report that examination of the fundi of 555 young diabetic patients revealed that 23 had retinal pathology resulting from their diabetic condition; and an additional survey of 260 young diabetic patients revealed that 43 had lens changes of the type usually associated with diabetes.

The lesions in the fundi of these patients, all under the age of thirty-one years, were characterized by punctate or small striate hemorrhages about the macula or in the region of the temporal vessels, and by small waxy yellowish-white or cotton-wool degenerative areas similar to those associated with cases of early diabetic retinopathy in older patients. In 6 of the 23 cases the retinopathy disappeared after strict control of the diabetes.

The incidence of retinopathy in young diabetic patients was 4 per cent in a series of more than 500 cases; diabetic cataract occurred in 14 per cent of 260 patients under the age of twenty-one years. These ocular changes have not been observed until recent years because young people with diabetes previously did not live long enough to permit retinal changes to develop. JOSHUA ZUCKERMAN, M.D.

Hogan, M. J., and Crawford, J. W.: Epidemic Keratoconjunctivitis. *War Med.*, Chic., 1942, 2: 984.

Over 200 patients suffering from an epidemic form of keratoconjunctivitis were seen between September, 1941, and the spring of 1942. Similar epidemics have been reported in Vienna (1899), Bombay, India (1901), Madras, India (1920 and 1930), London (1933), China (1936), Germany (1932 to 1940), Malaya (1941) where 3,500 cases were reported, Hawaii (1941) where 10,000 cases were estimated, and more recently in Portland. The present report is based on 125 cases.

The initial symptoms are those of acute conjunctivitis with the development, in from 36 to 48 hours, of marked edema and hyperemia without marked secretion, most marked in the lower lid. Involvement of the preauricular, angular, submaxillary, and cervical lymph glands occurred in about three-fourths of the cases and is considered an important early diagnostic sign. Thirty-one of the 125 cases became bilateral. Keratitis was present in about 92 of the 125 cases, beginning from the second to the eighth day of the conjunctivitis. The typical finding was that of macular infiltrates, from 10 to 100 in number, chiefly in the superficial substantia

Fig. 1. Pseudomembrane on the conjunctiva of the upper lid.

propria beneath Bowman's membrane, with some of them involving the epithelium. The corneal lesions outlasted the conjunctivitis, but in most cases they became faint within three months. The ultimate prognosis for vision is usually good.

The etiology is unknown. Bacteriological findings have been universally negative. The disease can be transmitted from human being to human being and in the absence of bacteriological findings it is assumed that it is probably a virus disease. Failure of the corneal infiltrates to break down and ulcerate also tends to substantiate the virus hypothesis. The authors found that the exudate was predominantly lymphocytic, a fact not previously recorded. Diagnostic points in the disease are considered to be:

1. Sudden onset with glassy edema of the caruncle, semilunar fold, lower cul-de-sac, and bulbar conjunctiva.
2. Early occurrence of tiny petechial hemorrhages on the mucous membrane in some instances.
3. The severity of the conjunctival signs with the absence of any discharge.
4. Enlargement of the preauricular node and other nodes, usually occurring early.
5. Absence of causative bacteria in smears and cultures.
6. Presence of lymphocytic type of exudate.

In most cases therapy has proved to be of little avail. Symptomatic treatment includes the use of iced compresses to reduce the edema, and atropine for the accompanying keratitis. Quinine-bisulfate ointment (2 per cent) seemed to assist in the removal of infiltrates after inflammatory symptoms had subsided. Twenty-two cases were treated with roentgen rays, 71 with 5 per cent sulfathiazole ointment, and 32 with a combination of the two. Results suggested that a combination of the two methods of treatment might be the most efficacious.

WILLIAM A. MANN, M.D.

Sanders, M.: Epidemic Keratoconjunctivitis ("Shipyard Conjunctivitis"). Isolation of a Virus. *Arch. Ophth.*, Chic., 1942, 28: 581.

Two things can definitely be said about epidemic keratoconjunctivitis: (1) its cause is unknown, although evidence points to a nonbacterial agent; (2) it is obviously infectious in nature, although according to Hogan and Crawford it is transmissible only by direct contact with susceptible persons. On the other hand, there is every reason to believe that epidemic keratoconjunctivitis is capable of inflicting moderately severe ocular damage on large portions of the population in the affected areas, since reports mention from 3,000 to 10,000 cases.

A possible specific agent for epidemic keratoconjunctivitis has been isolated. From the following experiments, this agent appears to belong to the virus group:

1. Material taken from the conjunctiva of a patient and injected intracerebrally into Swiss mice produced symptoms similar to those obtained under the same clinical conditions.

2. The infectious agent was maintained when brain emulsion from the second mouse passage was injected into tissue culture. Serial subcultivation was possible only at room temperature and by the use of ground-up tissue culture at inoculum.

3. A human volunteer's conjunctiva, upon receiving the mouse virus, responded in four days with a mild conjunctivitis. The incubation period was the same as that in human beings. When the mouse virus was again applied to the same eye, typical epidemic keratoconjunctivitis developed in four days.

4. The pathological picture in mice is not unique, but it does not resemble that in other common virus infections.

5. Definite neutralization of the agent was obtained when it was mixed with the serum of a patient who supplied the original material. The neutralizing power of the serum varied from 100 to 10,000 mouse doses. The serum from a cured patient also showed neutralizing antibodies.

In spite of the fact that the original material passed through only 2 mice, the presence of a contaminating latent mouse virus should be excluded by exhaustive tests.

A third cured patient failed to show neutralizing bodies. It is essential to perform more tests with the virus and serum from patients known to have had the disease. Care should be taken in these tests to check the diagnosis, the severity of the disease, the presence or absence of corneal involvement, and the extent and duration of lymph-node involvement.

A second isolation of virus seems to have been effected, and, while not fully identified with the first, it followed the course of the first in all details; the agent is filtrable through collodian membranes measuring from 75 to 1.0 millimicrons; the serum of the first isolation patient neutralized the virus of the second patient, and the serum of the second patient also neutralized the virus of the second isolation. This is a preliminary report.

LESLIE L. MCCOY, M.D.

Sniderman, H. R.: Orbital Metastasis from Pancreatic Tumor. *Am. J. Ophth.*, 1942, 25: 1215.

The occurrence of carcinoma deep in the orbit, without involvement of the globe, lacrimal gland, or skin, is rare. In the literature reviewed, the author was unable to find any record which showed adenocarcinoma of the orbit as having originated in the pancreas. Two cases are reported.

Two main types of carcinoma of the pancreas have been observed: the cylindrical-cell adenocarcinoma arising from the ducts, and the carcinoma simplex arising from the parenchyma. These are usually scirrhous in type. From its site in the pancreas, cancer is likely to metastasize by infiltration to the duodenum, stomach, common bile duct, mesentery, and the omentum. Carcinomas of this type have also been known to metastasize to the brain, bone marrow, liver, mediastinal lymph nodes, lungs, and spleen.

Adenocarcinoma is a well differentiated growth of epiblastic origin. Histologically, it has the appearance of having originated within the glandular tissue from certain secretory cells, and of maintaining its characteristics through various grades and degrees of malignancy or rates of growth. It occurs in practically all parts of the body in which glandular tissue is found, and, since it spreads by direct extension through contiguous tissues as well as by metastasis, it is considered to be one of the most lethal types of malignant conditions. Only a few cases of proved adenocarcinoma of the orbit of all types have been reported, and the majority of these have involved the lacrimal gland. Metastatic adenocarcinoma is seen less frequently than other types of carcinoma.

The majority of those who have studied this condition of the orbit conclude that the paralytic ocular symptoms are nearly always of muscular origin and that these symptoms are due to neoplastic muscular invasion. The ocular musculature constitutes the site of election for metastatic carcinomatous deposits in the orbit. Another conclusion is that invasion of the orbit takes place through the vascular circulation. LESLIE L. MCCOY, M.D.

EAR

Shea, J. J.: Mycosis of the Middle Ear and Mastoid. *Laryngoscope*, 1942, 52: 784.

Mycotic infections of the middle ear and mastoid are more frequent than American literature indicates. Multiple perforations of the membrana tympani have been found more frequently in mycotic infections than in tuberculosis. The presence of fungi on culture is not decisive proof that the pathology is the result of mycotic infection, but the etiology can best be assessed by: (1) a clinical picture suggestive of mycotic infection; (2) the type of fungus; (3) the response to fungicidal agents; and (4) special specific tests as skin responses and serological reactions. Mycotic infections of the external ear are very common in the summer months. Four cases of mycotic infection of the mastoid and two of the middle ear have been treated during the past five years and are reported. Of the mastoiditis cases 2 were of aspergillus niger and 2 were reported as nocardia. Oidia predominated in the 2 middle-ear cases. The drum is likely to present multiple perforations revealing small polyps. When the mastoid cells are opened the pigmented fungus is seen in contrast to the yellow bony walls.

The disease is usually confined to the pneumatic spaces and the lining; it is polypoid in character. A wet radical mastoid cavity provides a perfect media for the growth of fungi in warmer climates.

The author follows the accepted classification of Smith which recognizes three types: yeastlike fungi, moldlike fungi, and the higher bacterial forms. The diagnosis by smear is hazardous and the culture on Sabouraud's media is a tedious procedure. Testing the skin sensitivity is more rapid, although uncertain. During acute purulent otitis media the bacteria will outgrow the fungus, but in the chronic stage the fungus proliferates.

The treatment recommended is both local and systemic. Potassium iodide, thymol, and sodium benzoate are the drugs of choice for systemic medication, and solutions or salves of these three are the best fungicides for local therapy. A salve of benzoic acid (12 per cent) salicylic acid (6 per cent), and chlorthymol (0.25 per cent) is melted and instilled into the middle ear and external canal in the liquid state. It should be repeated every two or three days in the beginning and may be removed successfully by suction through small pipettes. Chemotherapy has not been successful in these cases. Four case histories are given of individuals in whom the fungus invaded the mastoid cell system and 2 the middle ear cavity. The author finds that mycotic infections of the mastoid and middle ear resist the most careful local and general therapy. Multiple perforations of the drum are characteristic, and usually a radical mastoid operation is necessary to eradicate the disease.

JOHN R. LINDSAY, M.D.

Williams, H. L., Herrell, W. E., Brown, A. E., Kernohan, J. W., and Wagener, H. P.: Otitic Meningitis. A Review of the Literature and a Report of Results Five Years Before and Since the Introduction of Chemotherapy. *Laryngoscope*, 1942, 52: 835. .

The authors made an attempt to review the published material upon which present knowledge of otitic meningitis is based. In the review they attempted to summarize the factors concerned with the etiology, pathogenesis, and classification of meningitis associated with or following suppurative disease of the ear.

In general, the treatment of otitic meningitis may be divided into 3 major procedures. The first concerns spinal drainage. Lumbar puncture repeated frequently enough to maintain pressure of the spinal fluid at a nearly normal value, has been entirely satisfactory in their hands. Occasionally, ventricular puncture with drainage may be a lifesaving procedure. Surgical eradication of the primary focus of infection is another procedure of great value in their hands. An attempt was made to formulate an opinion concerning the procedure of choice, as well as the optimal time of operation. Whenever possible, chemotherapy is advocated in conjunction with the surgical procedures. Best results are experienced when the sulfonamide drugs are used preoperatively as well as postoperatively. The use of sulfonamide has given to the otologist the third line of attack.

In order to evaluate the possible advance in the management of otitic meningitis since the introduction of chemotherapy, clinical material at the Mayo Clinic seen over a ten-year period was taken as the basis for the present study. In the series of patients observed during the last five years, chemotherapy was used in addition to necessary surgical treatment. The results in this group are compared

with those obtained in a similar five-year period prior to the introduction of chemotherapy, when treatment consisted of the same type of surgical procedures without chemotherapy.

In spite of an increase of nearly 25 per cent in the number of patients hospitalized for diseases of the middle ear and sinuses during the years of chemotherapy, the incidence of otitic meningitis has decreased by 48 per cent. This represents a decrease in the incidence of otitic meningitis of approximately half as compared with the incidence in the five-year period preceding the introduction of chemotherapy.

The recovery rate in the five-year period before the introduction of chemotherapy was 35 per cent. In other words, a patient suffering from otitic meningitis had only 3 or 4 chances out of 10 to recover. In the group of patients who received adequate chemotherapy in addition to the indicated and previously employed surgical procedures, the recovery rate has been nearly doubled (69 per cent). In other words, instead of 3 or 4 chances to recover from this rather serious disease, a patient now has nearly 7 such chances.

No attempt was made to disregard the fundamental principles of otology, well established through years of experience, and the use of chemotherapy alone was not advocated. Its use in adequate amounts with the maintenance of adequate concentrations in the blood in overwhelming sepsis of any type is perhaps the greatest single factor in the successful management of otitic meningitis.

NOSE AND SINUSES

Shea, J. J.: The Management of Fractures Involving the Paranasal Sinuses. *J. Am. M. Ass.*, 1942, 120: 745.

The management of fractures involving the paranasal sinuses follows the general principles of sinus surgery. The end-results should be a restoration of the features, and especial care should be taken to obtain symmetrical orbits, the re-establishment of good ventilation, drainage of the sinuses, and a satisfactory bite. NOAH D. FABRICANT, M.D.

MOUTH

Knighton, H. T.: The Effect of Various Foods and Cleansing Agents on the Elimination of Artificially Inoculated Yeast from the Mouth. *J. Am. Dent. Ass.*, 1942, 29: 2012.

The author's aim in these experiments was to determine the effectiveness of certain foods and artificial cleansing agents in removing loose particles of debris scattered over the entire mouth. The development of the method was the result of preliminary experiments. Only the mechanical phases of the elements used in this study were considered—not their therapeutic value.

The effectiveness of the chewing of fibrous elements, such as apples, sliced oranges, and paraffin, was indicated. WM. G. SKILLEN, M.D.

Becks, H.: The Dangerous Effects of Vitamin D Overdosage on Dental and Paradental Structures. *J. Am. Dent. Ass.*, 1942, 29: 1947.

The dangers accompanying overenthusiasm in biological therapy are once again illustrated by this author's thorough demonstration of the untoward effects on the entire dental apparatus produced by overdosage with Vitamin D. He describes with photomicrographic examples the pathological changes which occur in the pulp, the peridental membrane, and the alveolar process; osteosclerosis resulting in the last. Growth and development of the teeth are delayed. The effects of various combinations of Vitamins A and D are discussed. A very complete bibliography on the subject is appended.

WILLIAM G. SKILLEN, D.D.S.

NECK

De Courcy, J. L.: A New Theory Concerning the Etiology of Riedel's Struma. *Surgery*, 1942, 12: 754.

Riedel's struma, or woody thyroiditis, was first described by Riedel in 1896. Since then various explanations for the cause of the disease have been advanced from time to time. Specific organisms as etiological agents have been fairly well ruled out. Other theories which have been advanced are: (1) the struma is the result of local inflammation in the thyroid; (2) some obscure biochemical irritant produces the changes; and (3) the struma is caused by degeneration of a previously enlarged thyroid to physiological demands. The author points out certain fallacies in each of these theories.

In the author's opinion, the struma results from a perithyroiditis which produces peripheral fibrosis about the gland, which in turn causes vascular constriction of the blood supply to the gland. The reduced blood supply results in the woody, fibrous changes seen in the gland. Thus the disease is in reality a vascular one rather than an inflammation.

Evidence to support the author's theory is based on 2 cases of Riedel's struma, 1 of which was operated upon quite early. These cases had a relatively acute onset, with elevated temperatures, tenderness over the thyroid, enlargement of the thyroid, and leucocytosis. These symptoms receded rapidly without a tendency toward suppuration, and the author considers these findings as evidence of perithyroiditis. The thyroid remained hard and enlarged, but the tenderness disappeared. At operation the thyroid was closely adherent to the overlying muscles, requiring sharp dissection. There was very little bleeding from the cut surfaces. The outer surfaces of the lobes were the most involved, thyroid tissue identifiable as such beginning about 1 cm. from the capsule. Histological examination revealed intense fibrosis, marked arteriosclerosis, and the formation of pseudogranuloma and pseudogiant cells.

From these findings the author considers that Riedel's struma is a vascular rather than a glandular disease, the change progressing from without the

gland inward. It begins with a perithyroiditis which induces constriction of the thyroid blood vessels and produces an ischemia of the gland. The author does not, however, explain the etiology of the perithyroiditis in presenting this theory.

LUTHER H. WOLFF, M.D.

Moolten, R. R., and Bruger, M.: Exophthalmic Goiter of the Juvenile Type. A Survey of the Literature on the Familial Aspects of This Disease and a Report of 2 Additional Cases. *Arch. Surg.*, 1942, 45: 623.

Statistics gathered from the literature by the authors reveal the infrequency of exophthalmic goiter in children. Stattler found that 5.3 per cent of his cases of exophthalmic goiter were in children under sixteen years of age. Bram found 0.8 per cent of such cases in children under eleven years of age, and Crile found 2.5 per cent in children under twelve years of age.

Many authors have stressed the part played by familial factors. Among 1,586 cases of exophthalmic goiter in children under seventeen years of age, reported in the literature, the presence of a familial history of thyroid dyscrasia was reported in only 93. Many authors failed to comment on the presence or absence of a familial tendency. Of these 93 patients with thyroid dyscrasia, 74, or 79 per cent, were female, and 19, or 21 per cent, were male, a ratio of approximately 4 to 1. The 93 patients were members of 66 families; 20 were sisters; 6 were mixed siblings, and 2 were brothers. A positive history of thyroid disease was obtained for the mothers of 30 and for the fathers of 11 of the 74 female patients with juvenile exophthalmic goiter, while the mothers of 9 and the fathers of 3 of the 19 male patients were afflicted with some form of thyroid dyscrasia.

Clinically, the picture of juvenile exophthalmic goiter resembles the adult type. However, in its early stages it is often overlooked, especially when exophthalmos is not well developed, since the emotional instability, the restlessness, and the fidgeting are not infrequently attributed to a childish lack of poise.

The immediate effects of subtotal thyroidectomy are as beneficial to juvenile patients with exophthalmic goiter as to adult patients. It is the ultimate result that is in doubt.

The preoperative handling of juvenile patients is similar to that of adults. The extent of operation is a controversial problem. Some believe that more gland should be left than in adults, while others believe less should be left. The latter believe that the regenerative quality of the gland is greater in the young patient and that, consequently, too much gland cannot be removed. The authors agree with the latter view.

The authors add 2 new cases of juvenile exophthalmic goiter; both patients were girls aged eleven and fifteen years, respectively. The mother of one and the father of the other had been operated on for exophthalmic goiter. EARL O. LATIMER, M.D.

Greene, J. S.: Atypical Changes, Laryngeal and Vocal, in Adolescence. *J. Am. M. Ass.*, 1942, 120: 1193.

The biological changes occurring in adolescence are so radical as to offer a plausible explanation for almost any condition developing at this time on an organic basis. These somatic changes are overshadowed, however, by the emotional upheaval consequent to the arrival of biological maturity. The new demands of the environment consequent to rapid physical development coming at this time of relative instability of the organism may prove too great and the individual may become neurotic.

Paraphonia, falsetto voice, or failure of the voice to change at puberty may occur on a neurotic basis, sometimes as the result of fear of assuming the grown-up masculine role. The larynx remains in an abnormally high position in the throat because of excessive action of the suprahyoid group of muscles, and the high pitched voice of childhood persists. It may be permanent unless corrected by training.

Falsetto voice may also constitute only one aspect of the whole syndrome in cases of endocrine involvement, such as Froehlich's syndrome or cryptorchidism. Improvement of the voice occurs under the appropriate endocrine therapy.

Dysphemia or stuttering is evidence of an emotional disorder based on constitutional predisposition. Although it begins in earlier years the difficulty is exaggerated with the increased mental conflict coming with adolescence.

Treatment along lines of eukinetics, rhythmics, relaxation, psychotherapy, speech re-education, and social therapy gives the best results.

Psychophonasthenia—a pinched, cracking voice which breaks frequently and varies in pitch—often occurs in adolescence and is psychic in origin. The neurosis is deep-seated and difficult to treat.

Hysterical aphonia is common in this age period, especially in girls. It is a result of psychic conflict, and usually represents an unconscious means of escape from certain situations. Psychotherapy is necessary to provide insight into the cause for the aphonia and to change the outlook on the causative environmental factor.

While the acute onset of these speech difficulties may be precipitated at puberty, the underlying or predisposing conditions have been present long before. Recognition and understanding of behavior problems and maladjustment, and careful guidance in early years of life by the pediatrician or physician may prevent disabling conditions later.

JOHN R. LINDSAY, M.D.

Neffson, A. H.: Tracheotomy in Cases of Acute Obstructive Nondiphtheritic Infections of the Larynx, Trachea, and Bronchi. General Study, with an Analysis of 126 Consecutive Cases Occurring during the Past Decade. *Arch. Otolar.*, Chic., 1942, 36: 773.

Neffson gives a general, comprehensive description of the various aspects of tracheotomy in cases

of acute nondiphtheritic obstructive infections of the larynx, trachea, and bronchi, together with detailed, practical suggestions for routine treatment and for the recognition and handling of unusual complications.

Of 1,360 patients admitted to the Willard Parker Hospital, New York, during the past decade with acute nondiphtheritic laryngeal obstruction, 126, or 9.2 per cent, required tracheotomy. The incidence of tracheotomy increased from 5.3 per cent during the first seven years to 19.4 per cent during the last three years, and the mortality rate of tracheotomy fell from 50 per cent during the first seven years to 24.3 per cent during the last three years. The fourfold increase in the incidence of tracheotomy was accompanied by lowering of the general mortality rate from 10 per cent in the first seven years to 8.5 per cent in the last three years. Probable factors in the reduction of the mortality rate are the improved postoperative care, the earlier recognition and treatment of serious complications, and the use of chemotherapy.

A remarkable increase in the incidence of infections due to the staphylococcus aureus has been noted during the past three years. The probability that this organism is a secondary invader in a primary virus infection is discussed. The use of sulfathiazole or sulfadiazine is recommended as the treatment of choice if chemotherapy is to be used before the infecting organism has been identified.

The difficulties and complications of decannulation are described, and therapy is suggested. The conclusion is reached that intubation is not the single important factor in prolonged cannulation, as is usually asserted. There are also the dense infiltration of the subglottic tissues, which often occurs in such infections; the formation of occasional strictures and webs, not due necessarily to the intubation; the occurrence of prevertebral edema with compression of the trachea; and tracheal stenosis around the wound because of anterior puckering of the posterior tracheal wall, granulation tissue around the wound, and erosion and scarring of the cut cartilaginous rings.

Practical suggestions for use during the performance of tracheotomy are given, and the routine postoperative care is outlined in detail.

NOAH D. FABRICANT, M.D.

Jesberg, S.: Postdiphtheritic Laryngeal Stenosis. *J. Am. M. Ass.*, 1942, 120: 1000.

This report is concerned mainly with the group of patients with laryngeal stenosis in the contagious service of the Los Angeles General Hospital during the last twenty-two years. Jesberg discusses the most common cause of laryngeal stenosis, namely diptheria, dwells upon the statistical incidence of this complication, and enumerates the various steps of procedure in its treatment.

NOAH D. FABRICANT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Gross, S. W., and Savitsky, N.: Extradural Hemorrhage in the Anterior Cranial Fossa. *Ann. Surg.*, 1942, 116: 821.

Extradural hemorrhage in the frontal fossa may be overlooked at operation unless the surgeon is aware that on rare occasions the hemorrhage may be limited to this area. Three cases are reported in which the hemorrhage was confined to the frontal fossa. In the first case the clinical findings were typical of extradural hemorrhage and a bilateral subtemporal exploration was performed with failure to find the clot. Autopsy revealed an extradural hematoma, 7 cm. in diameter, compressing the tip of the frontal lobe in the right anterior fossa. No fracture of the skull could be found. In the second case a diagnosis of left extradural hemorrhage was made and when the usual subtemporal exploration failed to reveal a clot, the incision was converted into a T-shaped incision to permit exploration of the frontal fossa. An extensive extradural hemorrhage compressing the frontal lobe was found. This patient made a prompt recovery. The third case was associated with a depressed fracture in the left frontal and parietal regions. Following operation the patient made a gradual recovery from aphasia.

The location of extradural hemorrhage depends chiefly on the meningeal arteries which are involved. In rare instances tears in the intracranial venous sinuses give rise to the hemorrhage. Occasionally the anterior and posterior meningeal arteries are the source of the clot. The authors believe that the anterior artery, a branch of the anterior ethmoidal artery, is the vessel injured when extradural clots are found in the anterior fossa. The importance of fracture of the skull has been unduly stressed in the diagnosis of extradural hemorrhage. The presence of a fracture line crossing a vascular channel is valuable supporting evidence, but absence of fracture has no diagnostic value when other evidence points to extradural hemorrhage. In the 3 cases presented in this report, fracture of the skull was found only once. In extradural hemorrhages of the anterior fossa the eye signs are likely to appear relatively late. The site of injury is of great localizing value and should guide the surgeon to the place of exploration.

JOHN L. LINDQUIST, M.D.

Botsford, T. W.: Primary Brain Tumor. Follow-Up Study of 179 Cases. *Am. J. Surg.*, 1942, 58: 345.

Candid statistical studies of the operative mortality and survival rate of various types of brain tumor are rarely seen; consequently, this very frank statistical study of 179 cases of primary brain tumor seen at the Peter Bent Brigham Hospital between July 1, 1932, and June 1, 1941, is especially valuable. No new procedures or new attempts at therapy are included. The tables in the original article should be studied.

Of 179 cases, 150 were verified by histological studies and 29 by ventriculography or pneumoencephalography. About one-half of the cases were gliomas. A total of 251 operations, including burr holes, subtemporal decompressions, and osteoplastic bone flaps, was performed upon 166 patients. The case mortality was 24.7 per cent for the entire group. For the gliomas the case mortality was 31 per cent; for the meningiomas, 26.3 per cent; and for the pituitary tumors, 23.5 per cent. The total operative mortality was 16.3 per cent, being 21 per cent for pituitary tumors, 19.1 per cent for gliomas, and 18.5 per cent for meningiomas. The mortality rate is high, and on account of this the method of treatment has been changed to a more conservative one in certain varieties of tumor; for instance, the pituitary adenomas and cerebellar medulloblastomas are now treated with x-ray irridation. As for the more malignant gliomas, it is thought that intelligent use of biopsy, decompression, and radiation therapy will give a better prognosis than other methods of treatment.

Fifty-nine (32.9 per cent) of the 179 patients are still alive, but studies of these show that 18 (30.5 per cent) suffer serious physical handicaps; none lead useful lives. However, 41 (69.5 per cent) of the surviving patients are leading useful lives. In giving a prognosis for results of operative treatment of brain tumor, the surgeon should bear in mind the high gross case mortality rate and also the possibility of the patient's survival with serious disablement.

ADRIEN VERBRUGGHEN, M.D.

Globus, J. H., and Sapirstein, M.: Massive Hemorrhage into Brain Tumor. *J. Am. M. Ass.*, 1942, 120: 348.

There have been many discussions about massive hemorrhage into brain tumor, and this complication has often been regarded as the reason for sudden death in these cases. Further, it has often been stated that such massive hemorrhage occurs as the result of trauma to the head during the clinical course of the brain tumor. Up to the time of publication of this article, very little has been offered in the way of proof concerning these two notations.

For this study, the clinical histories of 375 cases of brain tumor were available, but only 94 were used. In these 94 cases no surgical procedures had been done; thus, surgical interference was excluded as cause of the hemorrhage. In the course of the study three factors were investigated: (1) massive and explosive hemorrhage into the tumor, (2) sudden and abrupt change in the clinical picture leading to a rapidly fatal termination, and (3) violence to the head occurring at some period in the history of the

patient with the tumor. Clinical information was correlated with them. Of the 94 cases, there are 9 of hemorrhage into a brain tumor, and in only 1 of these did the hemorrhage occur before the tumor was diagnosed. In 2 other cases, in which the tumor had previously been diagnosed, there was sudden death with hemorrhage into a tumor, and in the other cases in which the patients had previously been diagnosed as having a brain tumor there was gradual decline leading to death. In the latter there was slow seepage of blood into the tumor mass.

The article contains very adequate statistical studies with references to various pertinent points, and the following conclusions were reached: (1) sudden death in the course of the brain tumor is rarely associated with hemorrhage into the tumor or trauma to the head; and (2) trauma to the head is not considered to play a part in the production of hemorrhage into a tumor.

ADRIEN VERBRUGGHEN, M.D.

Gross, S. W., Stein, A., and Myerson, P. G.: The Surgical Treatment of Gummas of the Brain. *Am. J. Surg.*, 1942, 58: 78.

When signs of cerebral neoplasm are found in association with serological evidence of syphilis, several possibilities must be considered: (a) brain tumor and latent asymptomatic syphilis may coexist; (b) a false positive reaction of cerebrospinal fluid may be obtained in the absence of clinical evidence or a history of luetic infection; (c) gumma of the brain may be responsible for the symptoms and the positive serology. The symptoms of gumma of the brain do not differ from those of any other tumor, and when positive blood and cerebrospinal-fluid serology is found in the presence of such symptoms, gumma should be suspected. The diagnosis of gumma can be made with certainty only by inspection of the lesion.

Three cases of gumma of the brain in which surgical excision was carried out are reported in detail. At operation the lesions in all cases were strikingly similar in appearance. The tumors were bound to the dura by inflammatory adhesions, and were nodular, firm, rubbery, and fairly well demarcated from surrounding cerebral tissue. The histological study showed a large central area of necrosis surrounded by connective tissue and an outer zone of lymphocytes, plasma cells, giant cells, and numerous blood vessels. No characteristic symptomatology was found and gumma was not suspected until the results of serological tests were reported. There was no evidence of cardiovascular or visceral syphilis in any of the cases. In 1 patient death occurred the second postoperative day because of herniation of the cerebellar tonsils through the foramen magnum. The 2 other patients received postoperative antiluetic therapy.

JOHN L. LINDQUIST, M.D.

Streit, P. H.: Tic Douloureux of the Glossopharyngeal Nerve. *Arch. Otolar.*, Chic., 1942, 36: 704.

Tic douloureux is an extremely interesting disease entity. It is characterized by short paroxysms of sharp, shooting, lancinating pain of overwhelming intensity in the regions of the tonsil and the root of the tongue and referred to the regions of the ear. Talking, swallowing, or touching the area produces the characteristic attacks by so-called trigger action. The attacks continue with varying frequency and intensity.

Intracranial section of the dorsal root of the glossopharyngeal nerve gives complete and permanent relief and is the operation of choice. When the intracranial approach is contraindicated, peripheral section of the nerve can be performed. It is complicated, difficult, and delicate, but it can be done. The motor, sensory, and sympathetic sequelae of the operation are minor. The subjective signs of section are anesthesia of the retropharynx and tonsil on the affected side, and loss of taste in the posterior third of the tongue. There may also be motor interference with the swallowing of solids.

In patients with this condition in whom intracranial intervention is contraindicated because of marked hypertension or cardiovascular disease, section and extirpation of the glossopharyngeal nerve in the neck are suggested as a means of obtaining relief. The greatest difficulty of the operation is that of recognizing the glossopharyngeal nerve.

NOAH D. FABRICANT, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Haagensen, C. D., and Stout, A. P.: Carcinoma of the Breast. Results of Treatment. *Ann. Surg.*, 1942, 116: 801.

There has recently been a sobering realization that the high hopes of the curative value of radiation in carcinoma of the breast, which were held a decade or more ago, have not been fulfilled. We face the fact that we must turn back to surgical removal of the disease, try to choose our cases for radical mastectomy with more exactitude, and perform the operation with more skill. In this task many factors of clinical and pathological judgment play a part, and our primary need is for more and better data upon which to base our decisions. It is with this end in view that the authors present the data regarding the treatment of carcinoma of the female breast at the Presbyterian Hospital in New York over a twenty-year period, from 1915 to 1934, inclusive. The number of cases is fairly large, totaling 1,040.

A special summary sheet listing some 700 different items to which reference might be made was first drawn up, and mimeographed. The data from the individual case histories were then carefully transferred to these summary sheets. When contradictory clinical findings were found to be recorded, as sometimes happened, they were studied critically and the truth was determined as well as possible by checking the descriptions against the photographs. Cards were finally punched from the summary sheets, and these cards were sorted in the tabulating machine to determine the correlations in which the authors were interested. In this way it was possible not only to work out the correlations between any number of different factors with ease, but the findings could be checked and counterchecked in a way that is scarcely possible by hand sorting and arithmetic. The authors' experience with the punch-card method leads them to recommend it strongly to all who wish to analyze extensive and complex medical data

The authors stress the importance of calculating operability and five-year clinical cure rates in absolute terms, that is, on the basis of the total number of patients seen in the clinic, and without any deductions whatever for patients lost track of, and in whom treatment was not completed. Only in this way can strictly comparable statistics from different clinics be obtained.

A total of 640 radical mastectomies was performed by a variety of methods. Unfortunately this series failed to provide any significant information regarding the superiority of the classical Halsted technique for radical mastectomy. Local recurrence in the operative field on the chest and in the axilla was distressingly frequent. It had developed in 22.8 per cent of the 640 patients within five years after operation. Death was usually due, of course, to distant metastases, which developed most frequently in the lungs, pleura, and bones.

During the course of the years covered by the present report there was an increasing tendency of the surgeons of the hospital staff to take a longer time to carry out radical mastectomy and to increase the extent of the dissection. There was suggestive evidence that these more radical operations gave better results. The operative mortality showed a slight increase as the duration of the procedure was prolonged beyond two hours. This again, however, was a factor which depended more upon the technique of the individual operator than upon the actual length of the operation. If proper care was taken to avoid operative shock by gentle handling of the tissues; if sharp dissection was done rather than scraping, tearing, and ripping apart of the tissues; and if dehydration of the tissues was prevented by keeping them covered with moist towels and compresses; four or five hours could be devoted to the performance of this operation without increase of the operative mortality to above 1 per cent. It was the authors' personal belief that this length of time was, indeed, needed to carry out the extensive and meticulous dissection required in the Halsted type of radical mastectomy.

Biopsy does not prejudice the end-results of radical mastectomy. Thus, the authors do not hesitate to employ biopsy if any doubt regarding the diagnosis remains. There are certain indolent forms of breast abscess, and forms of fat necrosis, which may be clinically indistinguishable from mammary carcinoma. The damage that is done by a radical mastectomy carried out for one of these benign lesions far outweighs the inconvenience of biopsy and the theoretical objections to it. It is the authors' practice to reduce the trauma of biopsy to a minimum by making only a small incision, and excising only a very small wedge of tissue from the superficial part of the lesion. They do not excise the whole tumor, because if this is of considerable size excision will open up tissue planes widely, and possibly increase the danger of spreading the diseased condition.

It is not the authors' practice today, at the Presbyterian Hospital, to give preoperative radiation to patients with operable carcinoma of the breast. This decision is based upon experience with radiation in patients treated subsequent to 1934, and, therefore, is not included in the present report. Postoperative prophylactic radiation has not been of any demonstrable value in their series. The usefulness of roentgenotherapy for recurrent disease is quite another matter. It has been of the greatest palliative value in controlling pain due to bone metastases, and in clearing up small local recurrences situated in the field of operation.

JOSEPH K. NARAT, M.D.

TRACHEA, LUNGS, AND PLEURA

Moyer, C. A., and McKittrick, J. B.: A Practical Consideration of Open Pneumothorax under Sodium Evipal, Sodium Pentothal, and Ether Anesthesia. *Ann. Surg.*, 1942, 116: 553.

A study of the effects of anesthetic agents on the respiratory phenomena associated with open pneumothorax is presented. This seems timely, in view of the fact that there has been such a marked increase in the number of penetrating wounds of the chest. Following the institution of open pneumothorax in dogs and in man, the fundamental changes in respiration noticed were as follows: an initial dominance of inspiratory activity and a retardation of breathing; a subsequent equalization of inspiration and expiration, and an acceleration of the rate; and, finally, in many instances, the dominance of the expiration and a slowing of the rate. In these experiments pneumothorax was induced by means of a cannula introduced into the chest and passed through the mediastinal pleurae in order that a rapid collapse of the lungs could be accomplished. In reverse manner, rapid re-expansion of the lungs was also possible. The intercostal nerves in the area of the cannula were injected so as to block reflex painful stimuli.

Twenty experiments were carried out: 7 with evipal, 8 with pentothal, and 5 with ether anesthesia. At the beginning of each experiment, the anesthesia was carried to moderately deep levels while the preparations were being made, but before recordings were begun the anesthesia was so regulated that the corneal, the lid, and the patellar reflexes were very active, and the electrically excited, reflex contraction of the semitendinosus muscle relaxed slowly. Three respiratory tracings were obtained: tidal air, chest breathing, and abdominal breathing. Blood-pressure recordings were made either in the femoral or carotid artery. It was found that during light pentothal, evipal, or ether anesthesia, the reactions of the animals to collapse of the lungs were similar. These reactions were those that have been described as the fundamental changes following open pneumothorax. Varied responses were obtained when moderately deep anesthesia was used. When evipal or pentothal was employed, it was found that it might result in a relative inspiratory apnea, a fairly equal prolongation of the inspiratory and expiratory acts, or a relative expiratory apnea. However, when ether anesthesia was used the reactions were similar in all of the animals. There was an intensification and a prolongation of the inspiratory phase which were of less degree, and a prolongation of the expiratory phase which was of greater degree than was found when the animals were lightly anesthetized. The responses to re-expansion of the lungs were also variable when moderate to deep evipal or pentothal anesthesia was employed. Some animals breathed more rapidly and deeply, while others breathed more slowly and deeply. Still others were apneic.

From these experiments several important findings were obtained. Asphyxia frequently exists during moderately deep barbiturate anesthesia in these animals, because of the presence of expiratory predominance. This is probably the result of selective stimulation on that particular portion of the respiratory center. At any rate the asphyxia plays an important role in the production of the postpneumothorax apnea and can be prevented by the intratracheal insufflation of air and oxygen. The apnea can also be prevented in those animals anesthetized with barbiturates by the simultaneous administration of small amounts of ether, which entirely suppresses the expiratory dominance. No postpneumothorax apneas were encountered in those animals anesthetized with ether. These barbiturates should be considered as being more dangerous anesthetics than ether, especially in cases in which pneumothorax exists, or will be produced. Also, with the use of these barbiturates there are no definitive signs of the depth of anesthesia. However, pentothal may be safely and advantageously employed to induce anesthesia that is to be maintained with ether, because ether effectively counteracts the untoward respiratory reactions seen under pentothal anesthesia. H. C. JERNIGAN, M.D.

Hepburn, J., and Dauphinee, J. A.: Successful Removal of Hemangioma of the Lung Followed by the Disappearance of Polycythemia. *Am. J. M. Sc.*, 1942, 204: 681.

Hemangioma of the lung is a rare lesion, and the first case treated by pneumonectomy to be reported is presented. A perusal of the literature revealed 7 additional cases, 4 of which were in infants or children. Two of the 7 presented polycythemia, an interesting feature which was present in the author's case.

A white female, twenty-three years of age, complained of dizziness, fainting, and thick speech. At the age of fifteen a "leaking valve" was diagnosed and clubbing of the fingers was noted. Three years before admission the blood revealed a count of 6,300,000 red cells and 14.2 gm. of hemoglobin. A roentgenogram of the chest two years before admission was diagnosed as fibrosis or a vascular endothelioma. At that time slight general cyanosis and clubbing of the fingers were noted. The spleen was not palpable. The red count was 4,790,000. At the present admission the heart was not enlarged and no murmurs were heard. The spleen was not palpable. Blood examination revealed a hemoglobin value of from 140 to 146 per cent (from 21.8 to 22.8 gm. per 100 cc.) and a red count of from 9,000,000 to 9,600,000, and a hematocrit reading of 80 per cent. The total blood volume was 8,500 cc. (normal 3,500 cc.). The diagnosis was questionable and the following conditions were considered:

1. Congenital heart lesion.
2. Generalized pulmonary condition.
3. Direct pulmonary artery to pulmonary vein communication.

An attempt was made to differentiate between these by artificial pneumothorax without success.

A right total pneumonectomy was performed by N. Shenstone and R. Janes on February 14, 1940. The cyanosis disappeared promptly on clamping of the root of the right lung. The patient maintained a normal color thereafter and made an uneventful convalescence. There was a prompt disappearance of the polycythemia, the red count going to 5,400,000 and then 4,300,000, and the hemoglobin returning to 93 per cent and later to 71 per cent.

The lung removed presented an angiomatous mass 8 by 6 by 4 cm. made up of cavernous sinuses and a diagnosis of cavernous angioma of the lung was made.

WILLIAM E. ADAMS, M.D.

Rienhoff, W. F., Gannon, J., Jr., and Sherman, I.: Closure of the Bronchus Following Total Pneumonectomy. *Ann. Surg.*, 1942, 116: 481.

Closure of the bronchus stump in pneumonectomy has received much attention during the past ten years, during which period the operation has been frequently performed for both primary carcinoma of the lung as well as for suppurative disease of the lung. The authors present experimental work carried out over a period of three years, as well as the results of pneumonectomy in 61 clinical cases. They include also an extensive review of the literature dealing with the development of the technique of closing the bronchial stump in experimental animals.

Two main problems were kept in mind in the experimental procedures: (1) a method of closing the bronchus in the dog which would give a high percentage of successful results, and (2) the development of a method which could be applied in human beings.

Experiments were carried out on more than 200 dogs, in which a total pneumonectomy was performed. In the earlier experiments many previously reported methods of bronchial closure were repeated, with various forms of suture material and different ways of applying it. The use of interrupted mattress sutures was found to be the most satisfactory.

Later experiments were divided into two groups of 36 and 48 dogs, respectively. In the first group only 2 deaths resulted, and these were from distemper. The technique described for this series made use of a row of from 4 to 6 interrupted mattress sutures placed anteroposteriorly and encircling a cartilage ring. No clamps were used. The mediastinal pleura was sutured over the end of the bronchus with interrupted silk sutures. Examination of autopsy specimens revealed healing to have taken place at the end of the bronchus.

In the second group of 48 dogs no mattress sutures were employed, but simple closure of the bronchial opening was accomplished by the use of mediastinal pleura which was brought down over the end of the bronchus by including small bits of peribronchial tissue in the interrupted sutures. Again, no clamps were used. Two deaths occurred in this group of animals and in these the bronchial stump had remained closed, death being due to distemper at the end of two and one-half weeks.

In the earlier part of the authors' experience with 61 consecutive total pneumonectomies, the technique for closing the bronchial stump was varied, and it was soon found that absorbable sutures were not reliable. Because of the difficulty in evaluating the results of the technique employed in clinical cases, the described experiments were performed. Of 61 patients who underwent pneumonectomy 47, or 77.1 per cent, survived the operation. In 34 (72.3 per cent) of these 47 patients, the bronchus remained closed.

From the experimental and clinical results obtained, the following conclusions have been drawn:

1. The primary bronchus should be amputated near the bifurcation of the trachea, only a short stump being left.
2. No crushing clamps or cautery should be used.
3. As few sutures as possible should be employed.
4. Closure of the bronchus should be made with one row of mattress sutures encircling a cartilage ring, and the bronchial opening should be covered with mediastinal pleura by means of interrupted sutures. In the last 27 consecutive cases in which this plan was followed, only 3 deaths occurred. There were only 2 bronchial leaks in the 27 cases and these accounted for 2 of the 3 deaths.

WILLIAM E. ADAMS, M.D.

Gibbon, J. H., Jr., Gibbon, M. H., and Kraul, C. W.: Experimental Pulmonary Edema Following Lobectomy and Blood Transfusion. *J. Thorac. Surg.*, 1942, 12: 60.

The authors had 2 deaths in patients from whom the lower and middle lobes of the lungs were removed, and autopsy showed nothing significant except edema of the remaining lobes. The question naturally arose whether the fluids which were administered during and after operation were in any way responsible for the development of the pulmonary edema. One patient had received 4,600 cc. of fluid, and the other 3,000 cc. within twelve hours.

The authors believed that it was reasonable to suppose that smaller amounts of intravenous fluids might produce pulmonary edema if the pulmonary vascular bed had been reduced by removal of one or more lobes of the lung. Experiments were devised and performed on cats. The results of these experiments showed that a blood transfusion of 15 cc. per kgm. of body weight when given to normal cats at a constant rate over a period of one-half hour caused no abnormal change in the saturation of the arterial blood with oxygen, either before or after a transfusion, and an autopsy showed no evidence of pulmonary edema. When the right middle and all lower lobes of the lungs were removed from cats, the saturation of the arterial blood with oxygen was normal before the lobectomy and as long as four hours afterward. However, at autopsies the remaining lobes were found to be congested but not edematous.

In 9 animals, after the removal of the same lobes of the lung, a blood transfusion of 15 cc. per kgm. of body weight was given. Most of the animals showed varying degrees of lack of saturation of the arterial blood with oxygen, and 4 of them died shortly after the completion of the transfusion. The oxygen capacity of the blood was then determined in 14 cats. It was found to be increased in 11 instances after the removal of all the lower lobes and the right middle lobe. In 2 of the remaining cats, in which increased capacity did not occur after lobectomy, subsequent blood transfusion failed to produce evidence of anoxemia, and in the third cat the anoxemia did not occur for some time following transfusion and was of a mild degree.

A blood transfusion of 15 cc. per kgm. of body weight did not produce pulmonary congestion or edema in normal cats. Pulmonary edema did not follow lobectomy, although the remaining lobes were congested, and weighed half again as much as the same lobes in normal cats. When a blood transfusion was given after completion of the lobectomy, pulmonary edema occurred in the majority of instances. The weight of the edematous lobes was approximately three times that of the corresponding lobes in normal cats. In normal cats the standard blood transfusion produced a transient increase in the systemic arterial, the pulmonary arterial, and left auricular, and superior vena caval pressures. In the lobectomized cats the pulmonary arterial pressure was found to be always well above the normal range. Blood transfusion resulted in a further increase and death. The systemic arterial and venous pressures in the lobectomized cats with transfusion were unchanged, or showed a slight rise until the animal was moribund, when the venous pressure rose and the arterial pressure fell.

The authors conclude that in cats in which there has been an acute reduction in pulmonary tissue a blood transfusion of size well tolerated by normal animals may produce pulmonary edema, decreased saturation of the arterial blood with oxygen, and death.

J. Daniel Willems, M.D.

Gibbon, J. H., Jr., and Gibbon, M. H.: Experimental Pulmonary Edema Following Lobectomy and Plasma Infusion. *Surgery*, 1942, 12: 694.

A plasma infusion of 15 cc. per kgm. of body weight was given at a constant rate, over a period of thirty minutes, to 9 normal cats. There was no sign of pulmonary edema before the animals were sacrificed or at autopsy.

The right middle and the lower lobes of the lungs were removed from 15 cats. Two animals died from pulmonary edema, and 1 died accidentally. The other 12 were sacrificed from four to six hours after the operation. None of these animals showed evidence of pulmonary edema before death or autopsy.

In 11 animals, after a similar lobectomy, a plasma infusion of 15 cc. per kgm. of body weight was given over a period of thirty minutes. Eight animals died from one to two hours after completion of the infusion with clinical evidence of pulmonary edema and autopsy evidence of fluid filling the trachea and bronchi. The other 3 animals lived and were sacrificed after two to four hours. In these there was no evidence of pulmonary edema at autopsy or before death.

The hematocrit values showed no constant change before and after plasma infusions in normal and lobectomized cats. There was generally a definite increase in the hematocrit values following the removal of 71 per cent of pulmonary tissue.

The plasma protein concentration was constantly elevated following plasma infusions in normal cats. There was a variable change in plasma protein concentration before and after lobectomy and after plasma infusion in the group of lobectomized cats.

The arterial blood was adequately saturated with oxygen in all of the normal and lobectomized cats which did not die from pulmonary edema. In the animals dying from pulmonary edema, the saturation of the arterial blood with oxygen was decreased.

There was no significant increase in the weight of the lungs of normal cats following plasma infusion. After removal of the right middle and the lower lobes in the animals which did not develop pulmonary edema, the remaining lobes showed an increase in weight of approximately 60 per cent. After removal of these lobes, followed by a plasma infusion, the animals that died showed an increase in the weight of the remaining lobes of approximately 300 per cent.

In cats, therefore, when there has been an acute reduction of pulmonary tissue, a plasma infusion of a size well tolerated by normal animals may produce death from pulmonary edema.

Samuel Kahn, M.D.

HEART AND PERICARDIUM

Harrison, M. B., and White, P. D.: Chronic Constrictive Pericarditis. A Follow-Up Study of 37 Cases. *Ann. Int. M.*, 1942, 17: 790.

A follow-up study of 37 cases of constrictive pericarditis seen at the Massachusetts General Hospital is presented. In all but a few of these cases the clinical diagnosis was confirmed by operation or by autopsy examination. Tuberculosis was responsible for the condition in 5 patients and pneumonia with polyserositis in 2; the cause was unknown or questionable in 29. Normal rhythm was present in 22 cases, auricular fibrillation in 14, and auricular flutter in 1 case. The electrocardiogram was abnormal in all of the cases. Pericardial resection was performed in 28 of the 37 patients.

Fourteen of these 28 were clinically cured although in a few instances a slight increase in venous pressure persisted and 1 patient died of pneumococcus pleurisy after one year. Three patients were much benefited by the operation. Two died primarily of the disease itself, 1 of tuberculosis soon after, and 1 of congestive heart failure four months

after the operation. In 5 death was related to the operation, 2 patients succumbing on the same day, 1 the day following, 1 two days after, and 1 six days following the operation. Four died of other complications, one month, one year, two years, and seven years, respectively, postoperatively. Nine patients, for various reasons, did not have pericardial resection.

WALTER H. NADLER, M.D.

Schiebel, H. M.: Stab Wound of the Pulmonary Artery with Suture and Recovery. Report of a Case with a Brief Review of Traumatic Cardiac Surgery. *Arch. Surg.*, 1942, 45: 957.

The surgical treatment of wounds of the heart is a relatively recent accomplishment. With increased experience and improvement of technique, recovery may be expected in about 50 per cent of the cases.

The authors were unable to find any case of recovery from a stab wound of the pericardial portion of the pulmonary artery reported in the literature. Rehn performed the first successful suture of the human heart in 1896. The most common cause of injury has been a stab with a knife or ice pick. Bleeding within the pericardial sac increases the pressure and therefore gradually decreases the return flow to the right heart with the resultant decreased cardiac output. Thus the symptoms are: (1) distention of the veins of the neck, (2) diminishing systemic blood pressure and failing pulse, (3) irregular cardiac action, and (4) unconsciousness with stupor or delirium.

Of a series of 452 nonoperative cases of cardiac wounds only 10 per cent recovered. Thus it is obvious that operative treatment is indicated in cases in which the symptoms described are present.

A forty-two-year-old Negro was admitted twenty minutes after being stabbed in the left chest. He denied severe pain but complained of soreness within the chest. Within a few minutes the respirations were 8, blood pressure was 80/62, and fluoroscopy revealed an enlarged and pulseless heart shadow. By the time the patient reached the operating room the blood pressure was 60/54. Coramine was administered which elevated the pressure to 80/66.

Under ether anesthesia a T-shaped incision over the heart exposed the pericardium after resection of parts of the fourth and fifth cartilages. Blood spurted from the pericardial cavity and 400 cc. were aspirated. The heart action improved immediately. About 1 cm. above the valves a small opening in the pulmonary artery was seen. With some difficulty this was closed with a purse-string suture of black silk and reinforced with mattress sutures. Closure of the wound was made, the blood pressure being 90/60 on return to the ward. The patient gradually recovered, his blood pressure being 100/52 within twenty-four hours. Although a bilateral pneumonia developed he responded to chemotherapy. Empyema also developed and was treated by closed drainage with recovery. Examination one year later showed no evidence of his former lesion.

WILLIAM E. ADAMS, M.D.

Touroff, A. S. W.: Further Experiences in the Surgical Treatment of Subacute Streptococcus Viridans Endarteritis Superimposed on Patent Ductus Arteriosus. *J. Thorac. Surg.*, 1942, 12: 1.

The author presented in a previous report the first case of patent ductus arteriosus complicated by subacute bacterial endarteritis in which operation was followed by recovery. In this report 4 operative cases with this 1 recovery were discussed. Since subacute streptococcus viridans endarteritis had previously been considered an almost invariably fatal disease, the prompt recovery of this patient was heartening to the operator. He has since treated 4 additional patients.

On admission to the hospital, blood cultures were positive in all 4 cases and chemotherapy was administered. In 2 cases the drugs were poorly tolerated and had to be discontinued; in the remaining 2 cases the chemotherapy was well tolerated but proved ineffectual. When referred for surgical treatment, all patients still presented evidence of active infection and blood cultures were positive. In 3 patients operation consisted of ligation of the duct, and in 1 patient it was division of the duct. The recovery of all 4 patients can be attributed solely to the operations, and all patients have remained well.

These results suggest most strongly that recovery of the patient in the author's previous report was not fortuitous. Furthermore, these results permit the inference that operative cure can now be anticipated with some degree of regularity, at least in those cases in which the infection is of relatively short duration.

The main pathological features of surgical significance in infected patent ductus arteriosus complicated by subacute streptococcus viridans endarteritis are: (1) friability of the ductus; (2) adherence of the ductus to the surrounding structures, the most important of which is the pulmonary artery; and (3) dilatation and thinning of the pulmonary artery.

One case has been followed up for one year, another for nine and one-half months, a third for eight and one-half months, and the last for five months. It is emphasized that 3 of these patients received no chemotherapy after operation.

The author concludes that surgical therapy consisting of ductal ligation or division of the duct is an effective form of treatment for subacute streptococcus endarteritis superimposed on patent ductus arteriosus. He believes that it is not necessary to supplement each treatment with chemotherapy. The operation is most likely to be attended with a low morbidity and mortality, and a high incidence of cure if it is performed during the early stages of the infection.

J. DANIEL WILLEMS, M.D.

ESOPHAGUS AND MEDIASTINUM

Davis, J. S., and Stafford, E. S.: Successful Construction of an Extrathoracic Esophagus. *Bull. Johns Hopkins Hosp.*, 1942, 71: 191.

Extrathoracic esophagoplasty is most successful when a jejunodermatoesophagoplasty type of anas-

tomosis is made. During the past decade 22 successful cases have been reported by authors in Europe and Asia but only 4 by Americans. Most of the operations in the past have been made for benign stenoses of the esophagus following burns. At present, the advancement of surgical treatment of carcinoma of the esophagus presents a more frequent need for restoration of deglutition.

A girl, two years and eleven months old was admitted October 8, 1928, having swallowed lye three weeks previously. Lemon juice and vaseline had been given previously which had healed the ulcers of her mouth and throat. Total regurgitation of food and fluids taken by mouth had been present for four days before admission.

A gastrostomy was performed and several attempts made at dilatation of the esophageal stricture. Repeated attacks of aspiration pneumonia with no gain in weight followed during the next eighteen months. In June, 1930, a cervical esophageal fistula was made which was very beneficial. During the following ten years the patient gained weight and developed normally. At the end of this time it was decided to make an extrathoracic esophagus. This was accomplished by a series of operations over a period of approximately one year, which entailed the use of two skin-tube grafts obtained from either flank. The skin tubes were transplanted, one at a time, to the pectoral region. A skin-tube esophagus was made in the usual manner by making parallel incisions from the region of the cervical esophageal fistula down to just above the gastrostomy opening. The making of this extrathoracic esophagus was done in stages, the upper portion first, and the skin-tube graft was used to cover the extrathoracic esophagus.

After producing a complete tube of skin down to the region of the gastrostomy opening a segment of jejunum was isolated and brought up through the transverse mesocolon and mesentery to the left of the fundus of the stomach and out through an upper abdominal wound. The divided ends of the jejunum left in the abdomen were reunited by end-to-end anastomosis. The segment brought out through the abdominal wall was brought up to the lower end of the skin-tube esophagus by tunneling beneath about 3 in. of skin just below the lower end of the aforementioned extrathoracic esophagus and united with the skin tube. The lower end of the free segment of jejunum was anastomosed to the fundus of the stomach by an end-to-side type of anastomosis. Following the completion of the operative procedures the patient was allowed to take a liquid diet and later a full diet, the function being very satisfactory. The gastrostomy opening was allowed to remain until the other tract had become well established, after which time it was closed by a minor operative procedure.

It should be certain that the esophagus is beyond repair before this operation is performed. Also, when it is used following resection of the esophagus for carcinoma, it should be postponed until a permanent cure seems likely.

Covering the skin tube by means of a tube graft has several advantages over the method in which the skin is drawn over it from either side. There is no suture line overlying a suture line in the skin tube and a full-thickness graft insures good blood supply. No tension over the new skin esophagus is present as often occurs with other methods. Deformity of the chest wall and late cicatricial stenosis are unlikely.

Healing between the jejunum and the skin occurs more readily than between the stomach and the skin. Ulceration of the jejunum just outside of the stomach may occur but as yet has not been reported.

WILLIAM E. ADAMS, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Moore, R. M., and Kennedy, J. C.: Mortality in Penetrating Wounds of the Abdomen in Civil Practice, with Particular Reference to the Influence of Hemorrhage. *War Med.*, Chic., 1942, 2: 912.

This report is based on 75 consecutive cases in which penetration of the abdomen was established at operation. As every wound of the abdomen or of the lower part of the chest wall was considered to be potentially a perforation of an abdominal viscus, an exploratory laparotomy was performed immediately if local examination of the wound failed to convince the surgeon that it stopped short of the abdominal cavity. In 40 of the 75 cases, the patients had stab wounds and in the remaining 35 the patients had gunshot wounds.

In 38 of 40 instances, a knife was used to inflict the wound. In the 2 other cases, an ice pick, and an automobile gearshift lever was used, respectively. In 31 cases, the wound was located in the abdominal wall, in 1 case it was in the lumbar region, and in the 8 other cases it was somewhere in the chest wall. In the last group thoracotomy sometimes preceded laparotomy, and then the wound of the diaphragm was sutured from above.

No serious internal injury could be found in 14 of the 40 cases although penetration of the peritoneum was proved at laparotomy in every instance, either by the discovery of blood in the peritoneal cavity or by observation of the fresh defect in the parietal peritoneum. In 4 cases the indication of internal injury was a large retroperitoneal hematoma and in 2 of these cases there was transient hematuria following operation. One or more wounds of the liver was the only significant internal injury in 8 cases; in 4 of these, hemorrhage had stopped and it was not necessary to suture the liver. In 14 cases, the gastrointestinal tract had been perforated in from 1 to 4 places, the site of perforation being the stomach in 1 case, the small intestine in 7 cases, and the colon in the remaining 6 cases. In 11 cases, there was some degree of evisceration through the stab wound.

There was a 10 per cent mortality as 4 of the 40 patients with stab wounds did not recover. Autopsies were performed and it was found that 1 patient died of peritonitis on the third day after repair of 2 jejunal perforations and reduction of an eviscerated jejunal loop. Another died of peritonitis and abscesses of the liver five weeks after suture of a perforation of the stomach. The remaining 2 deaths resulted from pulmonary complications in patients whose injuries had been confined to evisceration of intestinal loops through large stab wounds without perforation; both patients had entered the hospital acutely excited from alcohol and were anesthetized with difficulty.

Simple suture of the perforations was ordinarily the only operative treatment required. In a few cases a short-circuiting anastomosis was performed. The abdomen was drained in 6 cases. After operation fluids were administered parenterally and constant gastric suction was maintained for several days. In several of these 6 cases the patients have had acute intestinal obstruction, but there has been no death from this complication to date.

In 33 of the 35 cases of proved penetration of the abdomen by gunshot, the missiles were bullets of various calibers. In the 2 other cases the injury was inflicted by shot. In 24 cases, the wound of entrance was on the abdominal wall, and in 6 cases on the chest wall. In the 5 other cases, it was located on the back, hip, or perineum.

The instances of injury to individual organs was as follows: pancreas, 1; kidney, 2; spleen, 2; liver, 7; urinary bladder, 3; stomach, 4; duodenum, 1; jejunum or ileum, 15; colon, 11; and large vessels, 4. Multiple injuries were present in many cases.

In 13 of the 35 cases, the patients failed to recover, making a mortality of 37.1 per cent. Severe hemorrhage and shock were the predominant features in the deaths; the patients did not live long enough for peritonitis to become advanced. In gunshot wounds of the small intestine the mortality was 40 per cent, in gunshot wounds of the colon 56 per cent, and in wounds of the stomach 50 per cent. The penetration of the gastrointestinal tract was not so important a factor in determining the mortality as was the amount of accompanying hemorrhage. In 100 per cent of the cases of gunshot wound of the spleen or large vessels the patients died, while in every other fatal case hemorrhage was so extensive that the operator reported the abdomen as "filled with blood."

Stab wounds of the abdomen seen in civil life offer a good prognosis if treated by immediate exploratory laparotomy. Drainage of the abdomen is not usually necessary. Gunshot wounds of the abdomen carry a much higher mortality as injury of the internal organs is more extensive than with stab wounds and a fair proportion of gunshot wounds result in critical hemorrhage.

This investigator has found that fatal infection occurs more commonly in the presence of spilled blood. Extensive hemoperitoneum in conjunction with perforations of the gastrointestinal tract favors extensive bacterial growth. Sublethal hemorrhage in association with perforation of the colon or the ileum acts mechanically to distribute infectious material about the abdomen and prevents localization of the contamination.

Penetration of the diaphragm should always be suspected when a stab wound has occurred in the lower portion of the chest. This is particularly important when the wound is on the left side, where hollow organs lie immediately beneath the diaphragm. In cases of such injury exploration of the

left upper quadrant of the abdomen may reveal penetration of the stomach, spleen, or colon.

Introduction of sulfanilamide into the peritoneal cavity following closure of traumatic perforations of the intestine will lower the incidence of fatal peritonitis. ALFRED B. LONGACRE, M.D.

Myers, R. S., and Zollinger, R.: Gastrointestinal Symptoms and Inguinal Hernia. *N. England J. M.*, 1942, 227: 660.

Approximately one-fifth of the 200 cases of uncomplicated inguinal hernia reviewed by the authors had symptoms referable to the gastrointestinal tract. Analytical breakdown of this group showed that 59 per cent of these patients gave a plausible explanation for their complaints of abdominal pain, gas, nausea, or vomiting. In 41 per cent of the patients, there were vague but persistent gastrointestinal symptoms, for which no cause was found prior to operation. There was no history of incarceration; diet and medical treatment brought no relief; and x-ray examination was negative when employed.

Although the majority of this group were relieved of symptoms following herniorrhaphy, 2 cases demonstrated gastrointestinal cancer as the true basis for their disturbance.

It is because of this finding that Myers and Zollinger think that the need for an intensive investigation of gastrointestinal symptoms in the presence of inguinal hernia is extremely important. This is true especially in the middle-aged and elderly patients. However, examples of apparently simple cases of inguinal hernia can be found in the younger age group in which ulcer and gall-bladder disease are the true offenders.

In order to avoid these pitfalls, the authors suggest (1) a painstaking history, with special reference to the nature of the gastrointestinal symptoms and their duration; (2) a thorough, general physical examination, which should reveal abdominal masses and tenderness over specific areas; (3) rectal examination with careful evaluation of the size, shape, and consistency of the prostate, as well as of any suggestive masses in or about the rectum; (4) laboratory studies of the blood, stool, and urine; and (5) if such measures fail completely to explain persistent gastrointestinal complaints, then the physician must carry out further investigation with the x-rays. By such investigation, basic and antecedent causes other than hernia may be discovered, and an ill-advised operation for inguinal hernia postponed.
STEPHEN A. ZIEMAN, M.D.

Zieman, S. A.: The Importance and Distribution of the Transversalis Fascia from the Viewpoint of the Surgeon. *Arch. Surg.*, 1942, 45: 926.

An extensive description and a discussion of the ramifications of the transversalis fascia as observed in a large series of dissections on cadavers are given.

The practical utilization of this far-reaching structure is recommended as a unit instead of many component parts. RICHARD J. BENNETT, JR., M.D.

Laufman, H., and Scheinberg, S.: Arterial and Venous Mesenteric Occlusion. An Analysis of 44 Cases. *Am. J. Surg.*, 1942, 58: 84.

This study is based on a series of 44 cases of portal and mesenteric occlusion, of which 40 were taken from autopsy records and 4 from case histories of patients who recovered. All but 1 case were proved by operation or autopsy. The incidence of the condition was 0.105 per cent of all surgical admissions. Males were afflicted more often than females, and the fifth decade had the highest age incidence. In every case of arterial occlusion that came to autopsy, the superior mesenteric artery contained a thrombus. In only 3 cases of venous occlusion were smaller mesenteric veins alone involved. In the remainder the portal vein or the superior mesenteric vein, or both, were involved. This finding explains the appalling mortality, and the futility of surgical resection in many cases. The length of intestine involved varied from 8 cm. to the entire length of the small intestine plus half the length of the large intestine. Two cases of arterial occlusion followed ablation of the lumbar sympathetic chain. Table I shows the causes of occlusion in this series of cases.

The results of occlusion of mesenteric vessels depend upon several factors: (1) whether the occlusion is arterial or venous; (2) the caliber of the vessel involved; (3) the suddenness of the occlusion; (4) the duration of occlusion before operation or death; and (5) the length of intestine affected. The author believes that the mechanism of hemorrhagic infarction following arterial occlusion depends upon the secondary relaxation of the intestinal musculature which causes the sucking back of blood remaining in the mesenteric arteries and veins.

TABLE I.—SUMMARY OF CAUSE OF MESENTERIC OCCLUSION

Cause	Arterial with infarction	Venous with infarction	Venous without infarction	Total
Abdominal operation	4	3	8	15
Heart disease	4	3	..	7
Arteriosclerosis	3	..	..	3
Liver disease	..	1	1	2
Malignancy	..	2	5	7
Abdominal infections	..	1	2	3
Splenic anemia	..	..	2	2
Congenital anomalies	..	2	2	4
Unknown	..	1	..	1
Totals	11	13	20	44

No definite set of signs or symptoms were pathognomonic for the disease; the most outstanding feature was that the clinical picture in general resembled that of intestinal obstruction or strangulation but was not typical of these conditions. Pain was out of proportion to the physical findings and usually persisted after antispasmodics or morphine was administered. Shock was more pronounced than in most other abdominal conditions. As a rule melena and bloody vomitus occurred too late to be of diagnostic aid, and were more common in venous occlu-

sion. Unless some obvious etiological factor was elicited in the history it was almost impossible to differentiate arterial and venous occlusion clinically.

The mortality rate was 90 per cent, if all cases with autopsy findings of thrombi in the portal and mesenteric vessels are included. Nine patients were operated upon, with an operative mortality of 67 per cent. Three patients recovered following resection of 8, 12, and 30 in. of infarcted intestine, respectively.

Surgical resection is the only hope for patients with infarction of an appreciable length of intestine, but there are 2 types of cases in which operation is of no value: namely, those in which all of the small intestine is deprived of its blood supply, and those in which the patient's general condition is so poor that any operative procedure is out of the question. The authors believe that many more patients could be saved if massive transfusions of from 2,000 to 3,000 cc. of blood or plasma were given preoperatively and postoperatively. Heparin administration to prevent propagation of the thrombus should be used only in those cases in which resection has been done, because in other cases it adds to the blood and fluid loss into the intestine and peritoneal cavity.

JOHN L. LINDQUIST, M.D.

Glamarino, H. J., and Jaffe, S. A.: Mesenteric Vascular Occlusion. A Review of the Literature and General Principles; Report of a Case with Operation and Recovery. *Arch. Surg.*, 1942, 45: 647.

The authors present a review of the literature on mesenteric vascular occlusion and a report of a case with operation and recovery. It is pointed out that the lesion is becoming more readily recognized and that notwithstanding the high mortality rate associated with it, surgical treatment offers the only possible hope when the lesion is recognized early and adequately treated.

Mesenteric vascular occlusion may be arterial or venous. In the arterial occlusion the lesion may be general or local with segmental infarction. The arterial type is due to embolism or thrombosis, with the former predominating. The reason for this can be explained on the basis of earlier exit from the aorta and also on the basis that the superior mesenteric artery is more of a direct continuation from the aorta. Clinically, there is usually a sudden onset of severe central abdominal pain. Vomiting is marked from the onset, constipation is present, and soon symptoms of intestinal obstruction become apparent. The severe pain overshadows the vomiting in severity and this helps to differentiate this lesion from all other types of intestinal obstruction. Examination reveals marked dehydration, and a varying degree of shock with generalized abdominal tenderness, spasm, and rigidity. Occasionally, thickened coils of intestine may be palpated, and rectal examination often reveals blood on the examining finger.

Abdominal exploration is urged as soon as the patient can be made as safe as possible for operation. The cases of occlusion of the arterial type demand even more urgent intervention, since no case of arterial occlusion without intervention can escape death. The treatment calls for excision of the affected bowel and mesentery even in desperate cases, for while closure of the bowel end with side-to-side anastomosis can be readily performed, exteriorization of the bowel has been fatal in practically all cases in which it was done.

The case reported was that of a thirty-eight-year-old man who had been operated upon three months previously for perforated duodenal ulcer. The lesion found at operation showed a loop of ileum which required resection. A large amount of bloody fluid was found in the abdominal cavity. The continuity of the bowel was restored by an end-to-end rather than side-to-side anastomosis and the patient proceeded to recover.

ANTHONY F. SAVA, M.D.

GASTROINTESTINAL TRACT

Steigmann, F.: The Treatment of Large Gastric Ulcers. Résumé of a Ten-Year Study. *Arch. Surg.*, 1942, 45: 764.

From observations and studies of 200 patients with large gastric ulcers during a ten-year period, the author concludes that gastric resection is the treatment of choice for large gastric ulcers. Although many of these patients do well on medical management, the clinical uncertainty with respect to the benign or malignant nature of the individual large gastric ulcer makes histological examination the only definite diagnostic procedure. Conservative treatment and even apparent healing of the benign large gastric ulcer is attended so frequently with chronic invalidism and the more serious complications which eventually lead to surgical intervention that early surgical treatment would appear advisable. The complications of conservative treatment specifically discussed are nonhealing and relapses, hemorrhage, perforation and penetration, tobacco pouch and hour-glass deformities, and occasional carcinomatous degeneration.

Considering these complications, the author advocates routine surgical intervention, not for all gastric ulcers, but for the large ones. With few exceptions high gastrectomy was the procedure of choice.

JOHN L. LINDQUIST, M.D.

Dudley, G. S., Miscall, L., and Morse, S. F.: Benign Tumors of the Stomach. *Arch. Surg.*, 1942, 45: 702.

It is well established that prothrombin is continuously formed in the normal liver in the presence of adequate Vitamin K. Attention has recently been focused on hepatic function and prothrombin deficiency in an attempt to correlate liver disease with the prothrombin contents of the blood. Also, it has been noted that prothrombin deficiency resulting from faulty absorption of Vitamin K, as in biliary fistula or obstructive jaundice, responded rapidly to Vitamin K therapy, while prothrombin deficiency

from primary liver damage either failed to respond to the vitamin, or did so at a slow rate. These observations suggested that one could differentiate between intrahepatic and obstructive jaundice by the prothrombin response obtained when Vitamin K and bile salts were administered.

In cases of extrahepatic obstructive jaundice, the decreased prothrombin in the blood returns to the normal level in from twenty-four to thirty-six hours after the oral administration of Vitamin K and bile salts.

Dividing their patients into three groups according to causation of the prothrombin deficiency, Allen and Julian confirmed their previous studies. The first group consisted of patients with obstructive jaundice in which one common factor was present—the inadequate absorption of Vitamin K. The second group consisted of patients with prothrombin deficiency and jaundice due to intrahepatic disease. The characteristic of this entire group was that the depressed plasma prothrombin was either not affected or only slowly elevated by the administration of Vitamin K. The third group was composed of patients without jaundice who presented primary prothrombin deficiency associated with cirrhosis of the liver and ascites. Though few in number, these patients provided a strong suggestion that the prothrombin level (always supposing an adequate intake of Vitamin K) provides a good index to the course of the disease of that particular patient.

The authors studied the question from a clinical as well as a microscopic pathological approach. And to the query, "Is it possible to anticipate the extent of liver damage from the response to Vitamin K in a given patient with liver disease?" they felt that no correlation was observed between the degree of damage shown in the microscopic sections or in the gross appearance of the liver, and the initial prothrombin level or the rate and degree of prothrombin response. They concluded that the degree of prothrombin deficiency with liver disease does not reflect the extent of the injury to the liver, and that in this sense prothrombin deficiency is not a reliable measure of liver function.

STEPHEN A. ZIEMAN, M.D.

Kirklin, B. R., and MacCarty, W. C., Jr.: The Incidence of Malignancy in Prepyloric Ulcers. *J. Am. M. Ass.*, 1942, 120: 733.

The prevalent assumption that prepyloric ulcers are more likely to be malignant than ulcers situated elsewhere in the stomach has been challenged in recent years. To elicit information that may help to solve the question, ulcerous prepyloric lesions observed roentgenologically and operated on at the Mayo Clinic during the period from 1937 to 1941, inclusive, were reviewed, subject to commonly accepted conceptions and definitions of the terms "simple ulcer," "malignant ulcer," and "ulcerating carcinoma." All ulcerating carcinomas that had been diagnosed roentgenologically were excluded from consideration. After other exclusions made necessary by the roentgenological approach, there remained 61 ulcerating carcinomas, and 71 ulcers, of which 63 were benign and 8 (11.3 per cent) malignant. These figures are compatible, though not identical, with the generally accepted estimate that from 10 to 12 per cent of all gastric ulcers, including many that appear roentgenologically and macroscopically to be benign, prove nevertheless to be malignant. This study thus supports the newer view that prepyloric ulcers are not more often carcinomatous than gastric ulcers in other situations.

On reflection it seems evident that the markedly diverse estimates as to the incidence of malignancy in prepyloric ulcers result from varying definitions and applications of the term ulcer.

Of much greater importance than the exact incidence of malignancy in prepyloric ulcers as strictly defined is the fact that a large majority of the lesions in this part of the stomach are ulcerous and malignant.

Lynn, D., Hay, L. J., and Wangensteen, O. H.: The Potential Closed Duodenal Loop in Gastric Resection. *Surgery*, 1942, 12: 566.

The occurrence of obstruction at the efferent outlet after gastrojejunal anastomosis is well known. Apart from a few reported instances of gangrene of the proximal afferent loop following gastrojejunal anastomoses, the occurrence of obstruction at the afferent inlet appears to have escaped the notice of surgeons and pathologists. In 1936, an instance of rotation of the proximal afferent jejunal loop with ensuant gangrene of the duodenojejunal loop, after an extensive resection for gastric carcinoma, was observed. In the intervening years, 3 additional patients have been seen who came to autopsy presenting evidences of distention of the afferent duodenojejunal loop just proximal to the gastrojejunal anastomosis. No suggestion of gangrene of the afferent duodenojejunal loop was apparent in any of these 3 patients; there was simply distention of this loop without obvious cause. The patients exhibited hyperthermia, tachycardia, and a gradual decline of the blood pressure, which was followed by death within eighty hours after operation. The postoperative sequence of events was very much the same in each instance. Members of the surgical staff were convinced that such dilatation of the proximal duodenojejunal afferent loop after gastric resection in the Billroth II type of operation was an item of real significance in the fatal issue. The possibility of this occurrence has been mentioned previously, together with a description of a technical maneuver to prevent its occurrence.

It is the purpose of this article to point out that dilatation of the proximal duodenojejunal loop after gastric resection may be followed by hyperthermia, vascular collapse, and death, without the presence of gangrene of the loop. Experimental obstruction of the duodenojejunal loop in the dog is followed by the same sequence of events. This occurrence in man is probably infrequent, but is a far more serious com-

plication than obstruction in the efferent outlet. Placement of an indwelling duodenal tube within the afferent loop at the time of operation obviates this potential hazard. That closed duodenal loops develop high intraluminal pressures is well known. It is well known that dogs with closed duodenal loops into which the biliary and pancreatic secretions drain, die with symptoms of vascular collapse and hyperthermia in just the same manner as human beings with obstruction of the proximal afferent duodenojejunal loop after the Billroth II type of operation. Ochsner and Storck have shown how a relatively small intraluminal pressure will obliterate the venous outflow from the duodenum, whereas far greater pressures are necessary to retard venous outflow from the colon.

It has been pointed out that obstruction at the efferent outlet in man, after gastrojejunal anastomosis, comes about largely through the agency of overinversion of tissue by the surgeon. In the experience of the authors, it is probably the sole cause of obstruction at the efferent loop. Approximation of from 0.5 to .75 cm. of the adjacent gastric and jejunal walls is sufficient for a satisfactory anastomosis.

On the other hand, the most likely cause of obstruction at the afferent loop is sharp angulation or kinking of the loop. Even incomplete occlusion may bring about a fatal issue.

It is obviously a frank break in the aseptic technique to pull out a straight or forked catheter from the residual gastric pouch through the gastrojejunal stoma in order to place the catheter, or both limbs of a forked catheter, into the afferent and efferent jejunal loops. Nevertheless, the authors' experience in the clinic with a large number of gastric resections for both ulcer and malignancy suggests that this is an important expedient in obviating a potentially serious complication. JOHN W. NUZUM, M.D.

Friedell, M. T., Shaar, C. M., and Walters, W.: The Effect of Gastric Resection on Gastric Acidity. *J. Am. M. Ass.*, 1942, 120: 666.

Gastric resection, including removal of the pylorus with the lower half of the stomach, is the best method of controlling hyperacidity. When symptoms are intractable and the patient is a young man, it is the best operation, as a rule. This is the problem faced in military life and, as has been emphasized recently, is a serious situation. The solution of this problem lies probably in the surgical management of these ulcers, since medical control in military life is virtually impossible.

The present study has been devoted to evaluating the actual reduction of gastric acidity by means of properly performed and indicated gastric resection. This operation is the best available to minimize the acid content of the stomach as an etiological agent in gastric ulcer. Even under the stimulation of histamine there is a marked reduction of acidity evident. That gastric resection is not always entirely successful, however, is also demonstrated. Dangerously high acid levels are still encountered under the influence of histamine stimulation, levels high enough to cause a return of symptoms, as they did in 1 case. The value of obtaining relative achlorhydria has been indicated, since in patients who have even a trace of free hydrochloric acid in the resected stomach, acid concentrations uniformly higher than in those with relative achlorhydria are present. Similarly in selected cases, such as those in which there has been previous perforation, or in which there is gastrojejunal ulceration, acid concentrations are reduced considerably, but not quite as satisfactorily as in those in which the patient is undergoing primary resection for duodenal ulcer (a more random selection).

Church, R. E., and Hinton, J. W.: Follow-Up Results in Subtotal Gastric Resection for Ulcer. *Am. J. Digest. Dis.*, 1942, 9: 317.

During the past fourteen years 1,256 patients with peptic ulcer were treated in the gastroenterological clinic of the Fourth Medical and Surgical Divisions of Bellevue Hospital, in New York, New York. Early in 1933, when the results of the authors' study revealed the numerous failures and complications following gastroenterostomy, they altered their operative procedure and since that time have performed subtotal gastric resections exclusively in all cases of chronic gastric and duodenal ulcers. They have followed 104 cases of subtotal gastric resection which have been under their observation for an average of two and eighty-eight hundredths years. The possible merit in this analysis is due (1) to the continuous personal contact between the patient and physician, which resulted in the studying and recording of all complaints, and (2) to frequent laboratory and roentgenological studies.

In a disease like peptic ulcer, in which symptoms present a cyclic phenomenon, single observations made yearly, or even after a lapse of several years, can be most misleading. There is no doubt that patients seen in an asymptomatic period seem to forget their former discomforts. It is the authors' policy never to accept or to use letters from patients in their follow-up studies.

The report includes 95 males and 9 females, a ratio of 9 to 1. In the majority of individuals suffering from peptic ulcer, the onset of the disease occurs between the ages of twenty and fifty years. This is the period of greatest mental and physical activity. The average age of the onset of symptoms was thirty-four and seven-tenths years, the youngest patient being sixteen and the oldest sixty-nine years of age. It was found also that the average duration of preoperative symptoms was over eight years. This emphasizes the growing practice of conservatism in ulcer surgery as represented in the authors' clinic.

Exposure to weather seems unquestionably to be a contributing factor in the disease. In this series of cases duodenal ulcer was found to predominate over gastric ulcer: 85.6 per cent of the ulcers were duodenal, 14.4 per cent were gastric, and 12.3 per cent were duodenal and marginal ulcers.

The factors that necessitated surgical intervention were chiefly pain alone, or pain and hemorrhage. Included under the first heading is pain which is not relieved by medication, rest, or diet, and which is without intervals of relief or periods of remission. Hemorrhage is an indication for operation if, in spite of adequate medical treatment, the patient continues to bleed repeatedly. Obstruction is an adequate cause for operation if repeated roentgen examination shows retention after six hours, associated with severe pain. However, since obstruction is caused by both spasm and edema, a conscientious effort must be made by the use of dietary regimen and antispasmodics to relieve the obstruction before advising operative interference. When pain is constantly present and associated with obstruction, operation is indicated. If from the roentgen studies, gastroscopy, and other laboratory data a differential diagnosis between ulcer and carcinoma is impossible, operation should be advised immediately. This does not occur in more than 10 per cent of the gastric lesions.

The Moynihan II type of resection with anterior anastomosis was performed in 90 per cent of the cases, and 65 per cent of the stomach was removed. As to the end-results of subtotal resection, 65.9 per cent of the patients were cured, 24.7 per cent were benefited, and 9.2 per cent were not benefited.

It is of interest to note that pain had been a preoperative finding in every case in which the result was unsatisfactory. Forty-six per cent of all the patients had no free hydrochloric acid postoperatively, and among these were patients classified as cured, benefited, and even without benefit from the operation.

Failure to resect an adequate amount of stomach and to remove the ulcer crater is the most common cause of recurrence. Marginal ulcers are not to be feared as a postoperative complication provided sufficient stomach tissue is removed and the ulcer is always removed *in toto*.

JOSEPH K. NARAT, M.D.

Wangensteen, O. H.: Method of Closing the Pyloroantral Pouch in the Antral Exclusion Operation. *Surgery*, 1942, 12: 731.

The antral exclusion operation is a recognized procedure in dealing with the difficult, indurated ulcer during the course of gastric resection for duodenal ulcer. Wilmanns, in 1926, pointed out the importance of removing the antral mucosa in such operations. From the work of Edkins, and from the clinical results obtained by various surgeons, including Ogilvie, Allen, and Welch, the author, and others, it appears that in order to rid a patient of the acid-ulcer diathesis, it is necessary not only to perform an extensive gastric resection, but also to remove the antral mucosa in the case in which the exclusion operation is done. Extensive gastric resection accompanied by complete excision of the antral mucosa abolishes the ulcer diathesis as effectively as does the operation of extensive gastric resection with complete excision of the pylorus and antrum.

Technical difficulty is frequently encountered in inverting the seromuscular cuff since it narrows in a funnel-like manner toward the pylorus and thereby produces considerable tension on the inverting sutures. Furthermore, a dead space is left between the closed mucosa and the seromuscular cuff. In 2 of a series of 13 cases in which the standard inverting closure was used drainage was thought to be necessary, and 2 cases developed subphrenic abscess which necessitated surgical drainage. These complications apparently resulted from leakage from the antral pocket. Because of this rather high incidence of complications, the author devised a type of closure which has proved uniformly satisfactory, there being no complications in a subsequent series of 15 cases.

The author's technique for closing the antral pouch consists of the following steps:

The mucosa with its attached submucosa is divided at the pyloric valve and closed with a running suture of catgut in the standard manner. Instead of inversion of the seromuscular coat, the submucosa and the circular muscular layer are carefully approximated with a single row of Halstead mattress sutures of fine silk, this procedure effectively obliterating the dead space. Next, the remnants of the pouch are cut away, and only enough tissue is left to permit easy approximation of the edges, without inversion. The closed pouch is then covered with a bit of omentum or it may be buried in the right transverse mesocolon. Drainage is not employed.

This antral exclusion operation with sacrifice of all of the antral mucosa when accompanied by an extensive gastric resection is a satisfactory and effective operation for so-called irremovable or inoperable duodenal ulcer. LUTHER H. WOLFF, M.D.

Joll, C., and Adler, D. I.: Long Survival after Gastrectomy. *Brit. M. J.*, 1942, 2: 632.

A brief review of total gastrectomy shows that the operation is indicated for patients in good condition when the carcinoma is operable and the anastomosis can be performed without tension.

Life after total gastrectomy is short on the whole, although those who survive may enjoy reasonably good health without any serious dietetic restrictions.

The authors report 2 personal cases—the first patient surviving a total gastrectomy for three years and two months, and the second for three years and six months. A total gastrectomy with retrocolic esophagojejunostomy was performed in both patients, one a man forty-five years old and the other a woman 42 years old. JOSEPH K. NARAT, M.D.

Wolf, S., and Wolff, H. G.: The Genesis of Peptic Ulcer in Man. *J. Am. M. Ass.*, 1942, 120: 670.

The authors have studied a patient with a large gastric fistula whose gastric mucosa was readily accessible to view. The patient was a man fifty-six years of age whose esophagus was completely occluded at the age of nine by his drinking a scalding beverage, and who, since then, had a surgically made gastric fistula.

Under basal conditions the patient elaborated small amounts of acid continuously. Spontaneous transitory phases of accelerated secretion of acid occurred every two to three hours and lasted from twenty to thirty minutes. These were accompanied by blushing of the mucous membrane and vigorous contractions of the stomach wall. Emotions of fear and sadness produced under natural conditions were accompanied by inhibition of the acid secretion, pallor of the mucosa, and diminished contractions.

Emotional conflict which involved anxiety, hostility, and resentment was accompanied by increased acid secretion, hyperemia, engorgement of the mucosa resembling that seen in "hypertrophic gastritis," and hypermotility. Symptoms of heartburn and abdominal pain accompanied these changes.

Intense sustained anxiety, hostility, and resentment increased and prolonged the engorgement, hypersecretion, and hypermotility. In this state erosions of the mucosa and hemorrhages could be induced readily by the slightest trauma, and bleeding points frequently arose spontaneously because of vigorous contractions of the stomach wall. When acid gastric juice contacted such a small eroded surface there was accelerated secretion of acid and increased engorgement of the entire mucosa. With prolonged exposure of such a lesion to the acid gastric juice, additional tissue damage occurred and a chronic ulcer appeared.

The lining of the stomach was found to be protected from its secretions by an efficient insulating layer of mucus which permitted most of the small erosions to heal promptly within a few hours. The absence of this protective mechanism in the duodenal cap may explain the higher incidence of chronic ulceration in this region.

From these observations the authors believe that the chain of events which begins with anxiety and conflict, produces over-activity of the stomach, and terminates with hemorrhage and perforation is that which is involved in the natural history of peptic ulcer in man. EDWARD W. GIBBS, M.D.

Ulfelder, H., and Allen, A. W.: Acute Perforation of Ulcers of the Stomach and Duodenum. *N. England J. M.*, 1942, 227: 780.

Three hundred and thirty-four cases of acute perforation of gastric and duodenal ulcer were seen at the Massachusetts General Hospital, Boston, in the years from 1916 to 1940, inclusive. The mortality by five-year periods shows no significant change during the past fifteen years. The mortality during the winter months is appreciably higher than during the other seasons. There appears to be some relation between this mortality and the virulence of current respiratory-tract infection. The mortality rises with the patient's age. The interval between perforation and closure is of fundamental prognostic importance. In the majority of patients who recovered when more than fifteen hours had elapsed between onset and operation, the perforation had already sealed spontaneously. J. M. MORA, M.D.

Mage, S.: Recurrent Ulceration Following Subtotal Gastrectomy in the Treatment of Gastroduodenal Ulcer. *Ann. Surg.*, 1942, 116: 729.

Although subtotal gastrectomy has been employed in the treatment of gastroduodenal ulcer for more than two decades, it has not been possible to discuss its asserted effects upon an adequate factual base. The proponents of subtotal gastrectomy have claimed that its radical approach not only minimizes the incidence, but also averts the serious complications of subsequent ulceration. No agreement exists relative to the frequency of recurrent ulceration. Moreover, since patients have been observed to develop recurrent symptoms after remaining well for periods of as long as thirty years, it becomes evident that any contention regarding this type of therapy is of little value unless the results are observed over a long period of time.

In the series of cases under discussion, there were 502 subtotal gastrectomies for primary and secondary duodenal ulcer, together with 98 similar operations performed for gastric ulceration. This report represents the work of a particular clinic, the Gastric Ward Service of Mount Sinai Hospital, New York, New York. The results reflect the experience of the entire staff of gastric surgeons operating during the period from 1923 to January 1, 1940. The patients were preponderantly Jewish. Indications for operation were: failure to respond to adequate medical treatment, intractable pain, unrelieved obstruction, and repeated hemorrhage.

Among the cases of recurrent ulceration in the duodenal group (41 patients), it was observed that ulceration recurred at from one to twelve years after surgery. Fifteen of the recurrences developed within the first year, but 6 developed after the sixth postoperative year. This emphasizes the absolute need for indefinite follow-up of the patients. Gross hemorrhage was a prominent symptom in 18 of these patients.

There is a striking difference in the response of gastric and duodenal ulcer to the same operation. A very significant observation pertains to the question of the relationship between gastric acidity and recurrent ulceration. This clinic has not observed a recurrent ulcer in the absence of free hydrochloric acid. Acidity studies have shown that subtotal gastrectomy creates an achlorhydria in at least 90 per cent of all patients with gastric ulcer, while it produces an apparent achlorhydria in about 50 per cent of all patients with duodenal ulcer. It is in the group with unneutralized free hydrochloric acid that recurrence is most frequently observed.

Most proponents of subtotal gastrectomy regard the creation of an innocuous achlorhydria to be one of the principal objectives of the operation. To insure success, certain surgeons insist on the removal of the ulcer. In the author's series of recurrent cases of ulceration, excision of the ulcer did not safeguard patients against subsequent ulcerations.

It is evident that the patient who is subjected to subtotal gastrectomy is not rendered immune to the

serious complications which are noted after other gastric operations. Intractability of pain, perforation, repeated hemorrhage, and gastrojejunocolic fistula may follow the radical operation. In the author's series of 41 recurrent ulcerations, a computation of the entire series showed 6.6 per cent of recurrences among the duodenal type of ulcer and only 1 per cent of recurrent ulcers among the gastric type. While it is assumed that radical resection of the ulcer is the best available operation at present, the impression is gained that it leaves much to be desired. JOHN W. NUZUM, M.D.

Patterson, T. L., and Sandweiss, D. J.: The Relationship between Gastroduodenal Motility Phases and Symptoms Associated with Duodenal Ulcer in the Human Being. *Am. J. Digest. Dis.*, 1942, 9: 375.

Twenty-one synchronous gastroduodenal motility studies are presented on 4 patients with duodenal ulcer; in all, approximately 75 hours of actual synchronous motility recordings are given. The dual balloon kymograph bromoform manometer method was employed. The patients recorded ulcer distress on the kymograph by means of an electric signalling device.

The four phases of synchronous gastroduodenal motility previously found to exist in the normal subject were also found to exist in the patients with duodenal ulcer; viz., (1) simultaneous gastric and duodenal motility, in which both the stomach and duodenum are exhibiting motility synchronously; (2) duodenal motility with a quiescent stomach, in which the duodenum exhibits motility at a time when the stomach is quiescent; (3) simultaneous gastric and duodenal quiescence, in which both the stomach and duodenum are in complete rest at the same time; and (4) gastric motility with a quiescent duodenum, in which the stomach exhibits motility at a time when the duodenum is at rest.

Ulcer distress experienced by the patients during the course of these studies was recorded only during periods when the duodenum was in an active state of motility regardless of the state of the gastric phase. The stomach was either in quiescence or in activity when ulcer distress was recorded. Ulcer distress did not occur in the third and fourth gastroduodenal phases, i.e., when the duodenum is in a quiescent phase. In other words, these studies so far indicate that the duodenum must be in an active motility phase for the patient with duodenal ulcer to experience ulcer distress. When the patients with ulcer experienced severe epigastric (ulcer) pains of relatively long duration (from fifteen to eighteen minutes or longer) there was a definite abnormality in the duodenal activity. The duodenum passed into a state of increased tonus simulating a condition of incomplete tetanus.

It is not the intention of the authors to convey the impression that abnormal duodenal motility is the only factor involved in duodenal ulcer distress. Other factors, in relation to the duodenum, that must be considered and studied are: the acid or alkaline concentration of the duodenal juice, the presence or absence of duodenal regurgitation, the normality or abnormality of the pancreatic enzymes and bile that enter the duodenum, and the potency of duodenal hormones such as enterogastrone.

While it was found that gastric motility may at times augment duodenal activity, it was also found that the duodenum at times initiates a period of activity when the stomach is in a quiescent state. This would appear to indicate that the duodenum possesses autonomy of action, and its period of activity and quiescence may be entirely independent of the stomach. JOSEPH K. NARAT, M.D.

Berk, J. E., Thomas, J. E., and Rehfuss, M. E.: The Acid Factor in Duodenal Ulcer as Evaluated by the Acidity in and Neutralizing Ability of the Duodenal Bulb. *Am. J. Digest. Dis.*, 1942, 9: 371.

The vast work dealing with the acid factor in duodenal ulcer has been concerned almost exclusively with the acidity in the stomach. Much is assumed but no precise knowledge is available concerning the acidity in the region of the duodenum where most clinical ulcers are found. The relationship between the acidity in the stomach and that in the ulcer-bearing duodenal bulb is particularly in need of further investigation. This study was undertaken primarily to supply some knowledge of the reaction and neutralizing ability of the contents of the first part (ulcer-bearing area) of the duodenum under various conditions of gastric acidity in order that the acid factor in duodenal ulcer might be evaluated more rationally.

Studies of gastric and duodenal acidity were made on 7 dogs, 22 normal human subjects, and 23 patients with duodenal ulcer. Samples of the gastric and duodenal contents were simultaneously collected from areas just above (pars pylorica) and just below (duodenal bulb) the pylorus.

All of the subjects were studied in the fasting state and after an Ewald meal. In addition, the dogs were studied following meals consisting respectively of 500 cc. of cream (20 per cent fat) and 500 cc. of Liebig's extract, accompanied by the subcutaneous injection of 0.1 mgm. of histamine base per 10 kgm. of body weight. The latter was given to produce a temporary condition of gastric hypersecretion. Two groups of duodenal-ulcer patients were also studied following an Ewald meal plus the administration, thirty minutes after the meal, of 15 cc. of aluminum hydroxide gel (Amphojel) in the one group, and of a powder consisting of 0.6 gm. of sodium bicarbonate and 2 gm. of calcium carbonate (Sippy powder) in the other.

The following conclusions are based on the knowledge gained from a study of all the data obtained, which comprised 19,986 separate determinations.

1. The contents of the first part of the duodenum are endowed with a considerable capacity to neutralize, buffer, and dilute the gastric chyme which

commonly exceeds the physiological needs. Nevertheless, even in normal subjects, the duodenal bulb is an acid area and free acid is not an abnormal finding.

2. In patients with duodenal ulcer, the neutralizing ability in the duodenal bulb is impaired but not wholly lost. Patients with duodenal ulcer appear to differ from normal persons in the direction of a defectiveness in the neutralizing capacity in the duodenal bulb as well as in the direction of gastric hyperacidity.

3. The acidity of the contents of the duodenal bulb is largely determined by the type of food undergoing digestion and is related only in part to the degree of the gastric acidity.

4. The acidity in the stomach and that in the duodenal bulb are not sharply parallel. None of the customary measures of gastric acidity reliably indicate the behavior of the effective acidity (pH) present over the same period of time in the duodenal bulb.

5. The oral administration of antacids in the usual therapeutic dose to patients with duodenal ulcer reduces the acidity of the contents of the first part of the duodenum, but the reduction is neither great nor long-lasting and may be followed by a rebound increase.

6. Neutralization of the duodenal bulb under fasting conditions equals, and in some respects surpasses, that observed during digestion.

7. The neutralizing power of the contents of the duodenal bulb in normal man is exceeded by that in normal dogs.

8. The acidity of the contents of the first part of the duodenum is generally insufficient to affect gastric motility significantly except in patients with duodenal ulcer. In dogs and in normal human subjects as well as in patients with duodenal ulcer it may be a factor in stimulating pancreatic secretion.

JOSEPH K. NARAT, M.D.

Allen, A. W.: Subtotal Gastrectomy for Stenosing Ulcer of the Duodenum. *J. Am. M. Ass.*, 1942, 120: 493.

Allen discusses the indications for operation in stenosing duodenal ulcer and urges subtotal gastrectomy as the procedure of choice. He differentiates between the slowly developing cicatricial occlusion and the edematous obstruction frequently seen in acute exacerbation of duodenal ulcer. The former occurs usually in patients past middle age. The stomach often is enormously dilated. Some of these patients are relieved by vomiting, or emptying of the stomach by tube. In a considerable number of patients, weight loss and gaseous eructations are the only disturbing factors. X-ray examination differentiates between this lesion and pyloric malignancy. The edematous obstructions occur in a much younger age group, and with drainage and supportive measures the edema subsides in from ten to twelve days. Such patients should not be subjected to surgery until it is obvious that surgery is necessary. The group of patients failing to respond to conservative measures and requiring surgery is small, but the author believes that anyone operating on a duodenal ulcer in any case except an acute emergency should be prepared to do a radical operation.

In a properly prepared patient the mortality is low. Preoperative preparation should be continued as long as the patient continues to improve. This may mean anything from the length of time required to combat shock from massive hemorrhage to the time required for an acute ulcer to subside, which may be several weeks.

Subtotal gastrectomy as the operation of choice for the small group of cases of duodenal ulcer which fail to respond to conservative management was the result of trial and error. On the author's service at the Massachusetts General Hospital, Boston, a tendency to jejunal ulcers was found when posterior gastroenterostomy was performed; and if, in gastrectomies, any antral mucosa was left *in situ*, the incidence of anastomotic ulcer proved to be higher than in any other conservative operation.

The author believes that the ideal operation consists of removing from one-half to two-thirds of the distal stomach, including the antrum, the pylorus, and the ulcer-bearing portion of the duodenum. He discusses in detail the technique of the operation and the complications that may cause an alteration of the technique, such as extensive external adhesions, the closeness of the ulcer to the pylorus, and the occasional advisability of a two-stage operation. For patients who are not good operative risks, he advises a concomitant jejunostomy for feeding.

In a series of 65 consecutive gastric resections for uncomplicated gastric ulcer, there was only 1 death. A larger group of patients with duodenal ulcer were operated on by the same staff, and in these cases the mortality rate was about 5 per cent.

After radical surgery, patients may require from three to twelve months to acquire an appetite and gain weight but the majority can carry on their usual occupations after a period of twelve months and live comfortably on 3 meals a day.

The author gives a short introductory summary of the acute surgical complications of duodenal ulcers, i.e., acute perforation and massive hemorrhage. In the latter it is pointed out that conservative treatment is much less likely to be effective in the older patients than in those under forty-five years of age, because, he believes, of the inability of sclerotic blood vessels to contract sufficiently to hold a thrombus in place over the required length of time. Radical operations for acute perforations are contraindicated.

MARIAN BARNES, M.D.

Berger, L., and Koppelman, H.: Primary Carcinoma of the Duodenum. *Ann. Surg.*, 1942, 116: 738.

Primary carcinoma of the duodenum is a very rare condition, as its incidence is reported as from .03 to .003 per cent of all autopsies. In other words, the percentage incidence varies from 3 in 10,000 to

3 in 100,000 autopsies. The authors report a proved case of primary carcinoma of the third (infrapapillary) portion of the duodenum.

In the author's case, the diagnosis made preoperatively was malignancy of the cecum and cholelithiasis. Laparotomy revealed a generalized abdominal carcinomatosis but no intrinsic lesion was observed in any organ. The patient died thirteen days after operation from coronary occlusion. At autopsy a primary carcinoma with microscopic appearance typical of cylindrical-cell carcinoma was found in the third portion of the duodenum.

The literature on all types of primary carcinoma of the duodenum is reviewed. It covers a total of 386 proved cases to date. Earlier diagnosis depends on the possibility of this lesion being kept in mind constantly in spite of its rarity. X-ray examination may be of great value if the lesion is looked for conscientiously.

While the results of radical surgery in duodenal carcinoma so far have been discouraging, the future results look brighter, since a rational surgical technique is available for each group of cases, and metastasis at the time of exploration is low.

JOHN W. NUZUM, M.D.

Puestow, C. B.: Intestinal Motility. *J. Am. M. Ass.*, 1942, 120: 903.

Human intestinal motility has been studied in a number of patients who, as the result of surgical procedures, have had various portions of the small and large intestine exposed, to permit direct visual observation.

The following findings were made:

A contrary motility exists between the small and large bowel: when the small bowel is vigorously contracting the colon is inactive, and when the colon contracts the small intestine appears to be inhibited.

Those drugs which stimulate motility of the small bowel, including the opiates, physostigmine, prostigmine methylsulfate and the choline derivatives, inhibit the colon.

A solution of the posterior-pituitary-lobe extract and pitressin produces powerful contractions of the colon, but diminishes the motility of the small bowel.

The author believes that postoperative distention may be due to the paralyzing action of morphine on the colon.

CHARLES BARON, M.D.

Herrlin, J. O., Jr., Glasser, S. T., and Lange, K.: New Methods for Determining the Viability of Bowel. Preliminary Report with Clinical Cases. *Arch. Surg.*, 1942, 45: 785.

The establishment of the viability of the bowel in cases of strangulated hernia is of great importance in abdominal surgical procedures at the time of operation since resection of the bowel greatly increases the operative hazard. In Frankau's series of cases of strangulated hernia immediate resection and anastomosis showed a mortality rate of 42.8 per cent, while in cases in which resection was not done the mortality rate was only 14.7 per cent.

The methods now used in doubtful cases rely mainly on the return of pulsation of the artery in the bowel segment concerned, and on the return of a pink color after the application of warm compresses. This procedure prolongs the operation and may add additional hazards.

The authors have studied the fluorescent effect of fluorescein wherewith direct visual evidence concerning the viability of an injured portion of the intestine can be obtained immediately. The findings revealed in animal experiments were exactly duplicated in 6 patients. After the strangulation was released and the intestine was observed under a purple light, from 5 to 6 cc. of 5 per cent solution of fluorescein was given intravenously and the special light directed on the portion of bowel of which the viability was doubtful.

Recent advances in the knowledge of peripheral vascular disease suggested the application of procaine hydrochloride in cases of circulatory changes in the bowel. The marked objective changes in the bowel could readily be accounted for by the end-results of vasospasm, which in itself is reflex in character. The established efficacy of procaine hydrochloride in releasing arterial and venous constrictions by means of inhibiting the autonomic impulses could be applied in the investigation of the circulatory competency of the intestine. These principles were applied both in experimental and clinical cases with excellent results.

Procaine hydrochloride injected along the vessels leading to a strangulated loop of intestine is able to release vascular and muscular spasms, and thereby restore the viability of the intestine. It serves not only as a diagnostic agent but also as a therapeutic measure. The time of strangulation is the most essential factor for the return of circulation in the bowel thus damaged. The persistence of the contraction ring at the point of strangulation cannot be considered a valuable diagnostic sign of nonviability of the bowel.

JOHN W. NUZUM, M.D.

Aldridge, A. H.: Intestinal Injuries Resulting from Irradiation Treatment of Uterine Carcinoma. *Am. J. Obst.*, 1942, 44: 833.

Sufficient irradiation to effect a cure of uterine carcinoma cannot be applied without some damage to the intestinal tracts of a considerable percentage of patients treated.

Approximately 1 of every 6 patients, 16.9 per cent, treated for uterine carcinoma developed some degree of proved injury to the intestine.

Only 1 intestinal injury occurred following the treatment of 47 patients for carcinoma of the corpus uteri.

Of 142 patients treated for carcinoma of the cervix uteri, 31 developed postirradiation intestinal injuries, including 23 intestinal strictures. In other words, an intestinal injury developed in 1 of every 4 or 5 cases treated for carcinoma of the cervix, and 1 of approximately every 6 patients treated had a postirradiation intestinal stricture.

The true incidence of such injuries cannot be determined without routine diagnostic studies of the intestinal tracts of all patients who develop significant postirradiation intestinal symptoms.

The development of intestinal symptoms and especially those of intestinal obstruction at any time from a few weeks to several years after irradiation for uterine carcinoma should always suggest the possibility of a postirradiation intestinal injury.

Careful diagnostic studies will serve to differentiate intestinal irradiation injuries from reactivations or extensions of malignant growths and may be the means of saving lives.

Success in the treatment of intestinal irradiation injuries will depend upon a knowledge of the possibility of their occurrence, early diagnosis, suitable palliative treatment, and, when indicated, timely operative interference. EDWARD L. CORNELL, M.D.

Wattenberg, C. A., and Heinbecker, P.: The Treatment of Acute Appendicitis in Children as Influenced by Chemotherapy. *Surgery*, 1942, 12: 576.

Since 1935 (Domagk), the treatment of infection in man by chemotherapy or sulfonamide drugs has progressed rapidly. Evidence has accumulated to prove that the effective coverage of most of the compounds is wide enough to include a number of organisms. This is true particularly for those organisms associated with peritonitis secondary to appendicitis: namely, the streptococcus, bacillus coli, bacillus welchii, and certain other anerobes. Sulfanilamide, sulfapyridine, and sulfathiazole have all been utilized as an aid to surgery in the treatment of appendicitis and its complications at the St. Louis Children's Hospital during the past four years. This article is presented to show the results of such treatment. A comparison of the results in this period is made with those of a previous period of fifteen years.

Most observers believe that the action of the sulfonamide compounds is one of growth inhibition or bacteriostasis. The newer drugs are capable of holding the invading organisms in check until antibodies are sufficiently developed to bring about bacteriolysis. A lag period of from four to six hours has been shown to exist before the maximum effectiveness of the drugs becomes manifest. It has been the practice to administer the drugs prior to operation in all cases of appendicitis in which peritonitis is diagnosed or suspected. Evidence has shown that it is in the invasive stage, not in the chronic or entrenched stage, that chemotherapy is most effective. This forms the basis for the belief that there is less danger in operating upon patients with peritonitis than formerly, provided an effective drug is used before, during, and after a limited period following operation. Chemotherapy of itself cannot be maximally effective when there is a continuing addition of infectious organisms or when pus is present in walled-off abscesses.

The blood levels found effective for sulfanilamide range from 8 to 14 mgm. per cent, and for sulfapyridine and sulfathiazole from 6 to 12 mgm. per cent. A 5 per cent solution of the sodium salt is given intravenously. The drugs are administered by mouth on the basis of 0.2 gm. per kgm. of body weight in 6 divided doses. Occasionally from 2 to 5 gm. of sterilized powdered sulfanilamide have been placed locally in an abscess cavity, in the area from which an adherent gangrenous appendix has been removed, or in the muscle layer during closure in case of an infected or potentially infected appendix.

Complications from the use of the drug in children have not been severe or frequent. No severe leucopenia or anemia has resulted. Jaundice has followed the use of the drugs in a few severely toxic patients.

Beneficial effects attributable to chemotherapy of the complications of appendicitis in children consist of a rapid decrease of the toxicity, a rapid regression of the peritonitis, a reduction in the number of cases requiring drainage, and a definite shortening of the period of illness. The added effect has been practically to eliminate death as a sequel to peritonitis associated with appendicitis. However, properly instituted surgery still plays the most essential role. The earliest possible removal of the source of contamination of the peritoneal cavity is imperative. Chemotherapy cannot be relied upon to cure infection of the peritoneal cavity from a gangrenous or ruptured appendix.

The operation is done through a low right rectus incision with retraction of the muscle in clean cases or splitting of the muscle in contaminated cases. The McBurney incision seldom is used unless a definitely localized abscess exists.

During the past four years, from 1938 to 1942, there have been 223 appendectomies at the St. Louis Children's Hospital with 5 deaths, a mortality of 2.2 per cent. The 5 deaths resulted from appendicitis associated with diffuse peritonitis. From 1940 to 1941 there were no deaths in the same hospital from appendicitis.

During the period from 1915 to 1932, before the advent of the sulfonamide drugs, there was a mortality of 7.89 per cent among 380 patients with appendicitis. The improved results are attributed essentially to the early removal of the appendix, to intensive and well directed preoperative and postoperative therapy, and to the adequate use of the sulfonamide drugs both before and after the operation. JOHN W. NUZUM, M.D.

Watkins, R. M.: Appendicitis in Cleveland. *J. Am. M. Ass.*, 1942, 120: 1026.

This review summarizes briefly the results from a study of 19,401 cases of acute appendicitis which were treated during a twelve-year period ending January 1, 1942, in 16 large hospitals of Cuyahoga County, Ohio, which includes Cleveland.

An apparent increase in the incidence of the disease was noted.

A reduction in mortality rate from 6.8 per cent to 2.8 per cent was attributed in part to less delay in

operation—the result of recent efforts to educate the layman regarding the dangers of the disease. Other reasons for the decline in the mortality rate were: less drainage, especially in perforated cases; the increasing use of the McBurney incision; and the improved economic conditions.

An increase was noted in the use of spinal anesthesia. No importance could be attributed to removal or nonremoval of the appendix at primary operation for appendical abscess as far as the mortality was concerned. Sulfonamides were used in too few cases to warrant conclusions. EDWARD W. GIBBS, M.D.

Heyd, C. G.: Increasing Usefulness of the Devine Colostomy in Left Colon and Rectal Surgery. *Ann. Surg.*, 1942, 116: 913.

The following features are essential to a good colostomy: (1) it should permit complete evacuation of all the contents of the colon proximal to its orifice; (2) it should prevent the spilling of the contents of the proximal loop into the distal loop; (3) it should be continent; (4) it should not produce excoriation or infection of the skin; and (5) it should require only a simple occlusive dressing.

The author satisfies all of these conditions with a Devine colostomy. Emphasis is placed on certain details essential to a good functioning result. An upper-right rectus incision is used; this splits the muscle fibers. The transverse colon is pulled out far enough to assure adequate length of the final free colon loops. The afferent and efferent arms of the loop are approximated by suture for a distance of at least 10 cm. Two short incisions are made parallel to and about 3 cm. from each side of the original rectus incision. These divide only the skin and subcutaneous tissue and through them are pulled the free loops after division of the colon. The abdominal incision is closed by interrupted through-and-through sutures of Malin stainless steel wire. The skin is closed around a short latex drain in the lower angle of the wound.

The postoperative care is discussed. The clamps are usually left on for three days.

The technique for closure of the colostomy embraces rehospitalization of the patient for the application of an enterotome, and subsequent office treatments.

The basic principles of defunctionalization and debacterialization of the distal colon in promoting safer colon surgery are again called to mind.

The Devine colostomy is recommended as a preliminary operation for the following: (1) abdominoperineal resection for carcinoma of the rectum; (2) rectosigmoidal carcinoma (permitting a low end-to-end anastomosis); (3) resection of a sigmoidal neoplasm; (4) acute perforating diverticulitis of the sigmoid; (5) correction of a fistula following anastomotic surgery of the left colon; and (6) cases complicated by intestinal, vesical, or rectal fistulas. It is also recommended as a preliminary or permanent colostomy for resection of the left colon and rectum in ulcerative colitis.

Interesting case reports illustrate each of the aforementioned indications. EDWARD W. GIBBS, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Lawrence, K. B., and Clute, H. M.: Intrinsic Diseases of the Liver Simulating Acute Cholecystitis. *N. England J. M.*, 1942, 227: 701.

Since the principle of early operation has been accepted as the safest method of managing acute cholecystitis, it is necessary to differentiate clinically between acute cholecystitis and certain other conditions of the upper abdomen that may be treated without operation.

The pathological changes in acute cholecystitis start with the blocking of the cystic duct, usually by an impacted gall stone. The resulting edema and venous stasis in the wall of the cystic duct plus obstruction to the outflow of gall-bladder contents set up a vicious circle resulting in a high degree of vascular and lymphatic block of the entire gall bladder. Local ischemic necrosis of the gall-bladder wall may then take place, and result in perforation if the area involved is large enough.

The clinical picture consists of local colicky pain, which radiates around the right lower costal margin to the right scapular region and is caused by the gall bladder's attempt to force a stone through its too narrow cystic duct. Nausea and vomiting may result from the overstretching of the peritoneal coat of the gall bladder as it becomes distended and causes visceral pain. The viscus may be palpable as a tense and tender mass below the right liver margin. There is a slight rise in temperature and pulse rate and a moderate polymorphonuclear leucocytosis. Later, an inflammatory reaction of the serosa may be manifested by tenderness and muscle spasm over the gall-bladder region.

The diseases of the liver may well simulate the clinical picture of acute cholecystitis. The following morbid mechanisms might be postulated: necrosis in a tumor nodule growing more rapidly than its blood supply, which causes a considerable reaction on the peritoneal surface; stretching of Glisson's capsule by an underlying hemangioma, abscess, or echinococcus cyst of the liver; and a more diffuse hepatic inflammation causing pain through both the mechanisms mentioned plus possible affection of the visceral sensorium, for example, a fulminating acute hepatitis or yellow atrophy. Fever, leucocytosis, systemic debility, or reflex gastrointestinal symptoms may be as commonly associated with certain of these conditions as with acute cholecystitis.

The clinical picture of acute cholecystitis may also be simulated by primary or metastatic cancer of the liver, particularly when secondary hemorrhage or necrosis has occurred. A history of previous malignancy should make one suspicious of this.

A fifty-six-year-old woman complained of pain in the right upper quadrant of five days' duration.

Fifteen years and two years previously she had been examined by means of x-ray films which were said to have shown trouble with the gall bladder. Five days before admission severe pain in the right upper quadrant began with radiation to the right posterior shoulder region, mild chills, and fever. There was a weight loss in three months of 34 lb. On examination, a tense, rounded, tender mass, the size of a small fist, was felt in the gall-bladder region. The liver edge could be palpated 5 cm. below the right costal margin, rounded and tender. A hard, polypoid mass involving the anterior rectal wall and invading the pararectal tissues was found; it was a malignant neoplasm. The admission temperature was 102.4 degrees, pulse 100, and the white-cell count 15,000, with 84 per cent polymorphonuclears. Laparotomy was performed and the mass proved to be a hard tumor nodule embedded in the liver. Just medial to it lay the normal gall bladder. A biopsy of one of the multiple tumor nodules showed an anaplastic, metastatic adenocarcinoma. The patient died six weeks later.

The following case illustrates the well known fact that certain cases of acute hepatitis present a clinical picture difficult to differentiate from acute surgical conditions of the upper abdomen. Knowledge of this, and the history of exposure to a hepatotoxin should make the surgeon doubly wary.

A thirty-six-year-old Negro complained of severe retching, vomiting, and malaise of three and one-half days' duration. He dated his illness from the inhalation of fumes from a broken fire-extinguisher bulb containing carbon tetrachloride. Eighteen months before entry, on a previous admission for gonorrheal epididymitis, the liver edge had been felt 3 finger-breadths below the costal margin; the patient was given 40 gr. of sulfanilamide daily for six days. He had been a chronic alcoholic for several years. On examination the temperature was 102 degrees, and the pulse 100. The upper two-thirds of the abdomen on the right side particularly was nearly boardlike and exquisitely tender. The white-cell count was 31,000. The urine contained a trace of bile. X-ray films showed the liver to be somewhat enlarged, but no free gas. Despite an atypical history, it was believed that the signs were those of an acute upper-abdominal peritonitis, possibly from a perforated gall bladder or peptic ulcer, and that immediate operation was imperative. On opening the abdomen an acute hepatitis with free bile-stained peritoneal fluid and toxic regional lymphadenitis was found. A biopsy specimen from the liver was diagnosed as acute hepatic necrosis (central type). The patient died four and one-half days later. An autopsy revealed a hemorrhagic central necrosis of the liver, probably due to carbon tetrachloride poisoning, toxic nephrosis, and pulmonary edema.

The following conditions have produced similar clinical pictures which simulate acute cholecystitis: ruptured hemangioma, spontaneous rupture of the liver and spontaneous subglissonian hemorrhage, simple cysts of the liver with or without rupture, tuberculoma and gumma, echinococcal cyst, amebic abscess, pyogenic abscess, and primary or metastatic neoplasms of the liver. ALFRED B. LONGACRE, M.D.

Munroe, H. S., Jr.: Solitary Nonparasitic Cyst of the Liver. *Ann. Surg.*, 1942, 116: 751.

Nonparasitic cysts of the liver may be single or multiple. Multiple cysts may be confined to the liver alone, but more commonly they are associated with cysts of the kidneys, pancreas, spleen, lungs, and brain. Multiple cysts are more common in children than in adults, and may be associated with other congenital malformations as harelip, cleft palate, and spina bifida. Solitary nonparasitic cysts are more common in adults. Whether justifiable or not, it is customary to differentiate sharply between solitary and multiple nonparasitic cysts of the liver. Whether the solitary cyst of the liver is a lone manifestation of polycystic disease or an entirely unrelated abnormal process is a debatable issue.

Cysts seem to occur more often in females than in males, the ratio being 4 to 1. This is explained on the basis that developmental defects are well known to be more common in the female sex.

Solitary cysts are most commonly found at the anteroinferior portion of the right lobe of the liver.

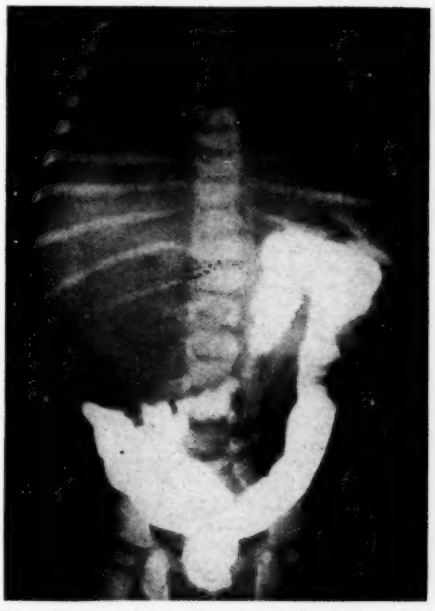

Fig. 1. Preoperative roentgenogram after barium enema, showing the marked displacement of the colon medially and inferiorly by the large mass occupying the right upper abdomen. As pointed out by Hofmann, this is a most important sign in the diagnosis of liver cysts.
(Courtesy of J. B. Lippincott Co.)

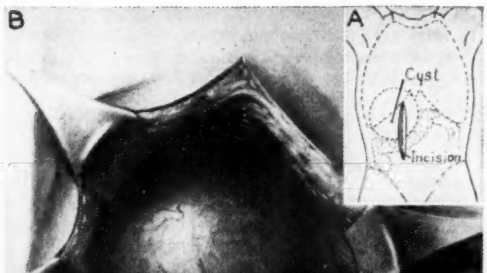

Fig. 2. Appearance and anatomical relationship of the mass upon operative exposure.

The quadrate lobe and the left lobe are sometimes involved, and, in still fewer cases, the cyst occupies the central portion of the liver. The size of the cyst and the amount of liver destruction vary considerably. Some cysts are microscopic, and some may fill the abdomen. An entire lobe of the liver may be destroyed by the cyst. The cyst may be wholly or partially intrahepatic, or it may be pedunculated. Little is known about the growth of these cysts, but apparently growth is so tardy that adjacent viscera quickly adapt themselves to their presence without symptoms, as a rule. In contradistinction to echinococcus cysts, these cysts have a characteristic low internal tension; their external surface is usually smooth, glistening, and grayish-blue, often showing many dilated veins. The appearance may be not unlike that of a smooth-walled cyst of the ovary. The internal surface of the cyst wall is usually smooth, less regular, and usually trabeculated. The thickness of the wall is variable. There is usually no definite line of cleavage between the intrahepatic and partially intrahepatic cyst wall and the normal liver tissue. The cystic contents vary from a clear, watery, sometimes yellowish-brown fluid, neutral or alkaline in reaction and with a specific gravity varying from 1.007 to 1.024, to a semisolid material resembling an organized clot.

The most generally accepted classification of nonparasitic cysts of the liver is that of Sonntag: (a) blood and degenerated cysts; (b) dermoid cysts; (c) lymphatic cysts due to obstruction or to congenital dilatation of the lymphatics; (d) endothelial cysts; (e) cysts due to obstruction of the bile duct; and (f) proliferative cysts (cystadenoma).

Solitary nonparasitic cysts of the liver apparently grow so slowly that in most instances few if any symptoms are produced, advice usually being sought because of the presence of a painless abdominal swelling. Occasionally, however, there may be a sudden onset of acute symptoms. This is seen, for instance, when an acute hemorrhage occurs into the cyst, when suppuration supervenes, or when the pedicle becomes twisted in the pedunculated variety. A correct preoperative diagnosis is rarely made, the majority of the cases being diagnosed on exploratory celiotomy or at autopsy. The condition is usually symptomless unless complications occur or the cyst compresses some adjacent structure such as the extrahepatic bile ducts or the first portion of the duodenum. With compression, there may be acute hepatic pain, nausea, vomiting, or jaundice. As most of these cysts arise from the anteroinferior surface of the right lobe of the liver, clinical examination will determine the site of the tumor while roentgenography may show that the tumor is part of the liver. One of the most important signs is that pointed out by Hofmann. With large cysts or tumors of the liver, the colon is pushed downward and to the left of the abdomen, while in the case of neoplasm or other enlargements of the kidney, the colon lies over the tumor. This point may be easily demonstrated by barium enema. In the case of all large pedunculated cysts of the liver, downward displacement is limited by anchorage to the liver, but a considerable degree of lateral movement is often obtained. Induced pneumoperitoneum followed by roentgenological examination has proved of little help. Peritoneoscopy may be an aid in diagnosis. Liver-function tests, as a rule, show little deviation from the normal.

The only treatment for solitary cysts of the liver demanding relief is surgical intervention. Complete extirpation of the cyst should be undertaken if conditions permit. Too frequently, this procedure cannot be wisely attempted without inviting disaster. Partial extirpation along with drainage and marsupialization, or just drainage along with marsupialization have produced satisfactory end-results in most cases. In some instances in which external drainage has been done, a sinus has remained for from a few months to years.

A solitary nonparasitic cyst of the liver in a nine-months-old child is presented by the author. The author stresses the extreme thickness of the cyst wall, and the fact that a large portion of the cyst was intrahepatic. Although the fluid content of the cyst was aspirated by needle, the cyst showed no tendency to collapse. The thickness and rigidity of the wall would not have permitted radical removal of the cyst, nor would an adequate closure have been possible after such a procedure; furthermore, this patient would not have survived such a radical attempt at removal of the cyst. A portion of the wall was excised for pathological study, and the cyst wall

was marsupialized to the peritoneum and the posterior rectus sheath. The end-result was very satisfactory, a complete cure being anticipated.

Reasons are presented for a classification of this liver cyst as hamartoma rather than cystadenomatous blastoma. JOSEPH K. NARAT, M.D.

Carpenter, W. S., and Vale, C. F.: Chemical Cauterization of the Mucosa of the Gall Bladder. *Arch. Surg.*, 1942, 45: 935.

There are two types of cases in which the decision to perform a less severe operation than cholecystectomy is important. These are: (1) cases in which the general condition makes the risk of cholecystectomy too great, and (2) cases in which removal of the gall bladder is hazardous because of the local lesion. In many clinics cholecystostomy is the operation performed, but in others some form of partial cholecystectomy or cauterization is done. During the years from 1935 to 1940 the authors have used cauterization of the mucosa of the gall bladder with solutions of phenol and alcohol, the procedure often called chemical cholecystectomy, as a preferred method for those cases in which cholecystectomy seemed unwise. They have done this in the hope that it would prove more successful than cholecystostomy, which is so often followed by a recurrence of the symptoms and pathological changes similar to those originally present.

The fundus of the gall bladder is opened, the bile is aspirated, and any stones present are removed. Usually a portion of the free edge of the gall bladder is then excised, and the remainder of the mucosa of the gall bladder is treated with from 4 to 6 applications of a 95 per cent solution of phenol, each of which is followed by an application of a 95 per cent solution of alcohol and drying with a sponge. No attempt is made to block the cystic duct. The phenol and the alcohol are allowed to gravitate well into the ampulla of the gall bladder. A soft rubber tube is inserted down to the ampulla, and the remnant of the gall bladder is folded and sutured about this tube which emerges through the fundus and is allowed to drain for from eight to ten days. No further drainage of the abdominal cavity is done. This technique does not alter any procedure which might be necessary on the common duct or any other intra-abdominal viscus.

During the past five years the authors have had occasion to perform this operation in 47 cases. In general they were pleased with the smooth convalescence of the patients in spite of the acute process found at operation. Elderly people tolerated it especially well. In no case did a fistula persist. In 6 of the 47 cases mentioned the operation was combined with exploration of the common duct.

The authors gained the impression that the chemical cauterization of the mucosa is followed by a lower rate of recurrence of symptoms than cholecystostomy.

Despite extensive chemical cauterization, the mucosa of the gall bladder regenerates rapidly. It appears that some of the deeper glands in the wall survive and become the source of new epithelium. The term chemical cholecystostomy is a misnomer, because the gall bladder is not completely eliminated as a functioning organ.

JOSEPH K. NARAT, M.D.

Moss, R. E., and Freis, E. D.: Clinical Features of Pancreatic Lithiasis. *N. England J. M.*, 1942, 227: 590.

Pancreatic lithiasis is not as rare as was formerly supposed. During the years from 1934 to 1941 at the Boston City Hospital, the diagnosis was made at operation in 2 cases and at autopsy in 1 case. During 1941 at the same institution, 3 cases of pancreatic stones were recognized among 700 autopsies, and 2 cases were observed clinically. The latter 2 cases are the basis of this report.

In 1 of the cases the diagnosis rested upon the roentgenogram; in the other the roentgenographic findings were confirmed by palpation of the pancreas at laparotomy. The pancreatic ferments of these patients were studied before and after stimulation with mecholyl. The lipase and amylase activity were in the low normal range and showed a significant increase after stimulation with mecholyl. The results of these tests indicate that some degree of pancreatic damage was present. There was no conclusive evidence that either of the patients had ever suffered from acute pancreatitis. One patient had cholelithiasis and frank diabetes mellitus and the other had a decreased glucose tolerance and an enlarged liver that showed improvement without the use of lipocaic. Steatorrhea was not present in either case. The detailed case reports are presented.

The clinical diagnosis is difficult but is often missed because pancreatic lithiasis is not thought of. Upper abdominal pain is usually the leading symptom, varying from mild distress to severe colic that resembles biliary colic. The pain is likely to be referred to the left side of the abdomen or back or to the left shoulder. Nausea and vomiting may be severe. Attacks seem to be induced by fatty foods or alcoholic excess. Fatty diarrhea is the most characteristic sign of the disease but is present in only about half of the cases and may be intermittent. A late sign of pancreatic damage is liver enlargement. Diabetes mellitus accompanied by abdominal pain of obscure origin should point to the possible existence of this disease. A flat film of the abdomen may reveal the calculi. The chief difficulty in the clinical diagnosis is the frequent absence of unmistakable signs of pancreatic insufficiency. To facilitate the diagnosis in the absence of steatorrhea, the use of pancreatic stimulants such as secretin or mecholyl gives a roughly quantitative estimate of the pancreatic output.

Although neither of these patients was treated surgically, the primary treatment of this disease is surgical. Removal of the obstructing stones has been successfully carried out to rid the patient of symptoms and to halt the further destruction of the

pancreas. Symptomatic treatment consists of the use of dried pancreatic juice. The colic is usually treated with morphine, although ephedrine is worthy of trial since it diminishes pancreatic secretion. Lipocaic may be of specific value in the treatment of the associated fatty liver.

JOHN L. LINDQUIST, M.D.

Rabinovitch, J., and Pines, B.: Cysts of the Pancreas. *Arch. Surg.*, 1942, 45: 727.

The basis of this report is a study of 17 cases of cysts of the pancreas. In 14 cases operation was performed. In some cases it was difficult for the operating surgeon to identify the cyst in relation to the surrounding structures and to determine whether it was a true pancreatic cyst or a so-called pseudocyst. In only 1 case was the tumor malignant. Pancreatic cyst may occur at any age but is most often seen in persons of middle age. The ages of the patients in this series ranged from twenty-one to seventy-six years, averaging forty-five and four-tenths years. The age period of greatest frequency was from twenty-one to forty-nine years. There were 14 female and 3 male patients, which shows a preponderance of the disease among female patients.

It is the consensus that pseudocyst is of more frequent occurrence than the other forms of cystic tumor of the pancreas; this was true in this series. The cyst may occur in any portion of the organ although it is most prevalent in the tail. The pathological description of the growth encountered in the reported cases makes one suspect that in the majority of instances the lesion is the result of some form of trauma to the pancreas. Experimental evidence also lends support to the view that trauma is an important causative agent in the production of pseudocyst of the pancreas. Sufficient evidence has accumulated, however, which points to other agents besides trauma as causative factors. Thus it is well known that after certain inflammatory conditions of the pancreas or gall bladder pseudocyst may develop in the pancreas. It is also of importance to note that in many instances no cause whatsoever could be discovered to account for the formation of the cyst.

From the embryological point of view it is conceivable that certain pancreatic cysts may arise from misplaced remnants of Brunner's glands. Such a tumor is described in 1 of the cases presented in this article.

The diagnosis of these tumors is beset at times with many difficulties. The early symptoms and signs are by themselves not distinctive and are similar to those associated with other intra-abdominal lesions. The laboratory tests, although of great value, are by no means infallible. Analysis of the diagnostic facts relating to this disease shows that pain is the most important subjective symptom. It was present in all of the operative cases, and varied from a sensation of fullness to sharp abdominal cramps. The location of the pain varied. In many instances the pain was associated with nausea and vomiting. Loss of weight occurred in 6 of the patients operated on, constipation in 5, and diarrhea in 2. Jaundice occurred in 3 patients.

Physical examination revealed that 10 patients were well nourished, that 2 were obese, and that 2 were emaciated. Only 3 patients appeared acutely ill on entering the hospital. Tenderness over the affected area was elicited in 5 patients. Pseudocystic tumor usually presented itself as a large semifluctuant mass. In 4 cases it was located in the left upper quadrant of the abdomen; in 3 in the right upper quadrant of the abdomen; in 2 in the lower part of the abdomen, and in 1 case the mass occupied the entire left side of the abdomen. The cysts are more apt to be freely movable when situated in the tail of the organ. Roentgen examination is a major aid in the diagnosis of cyst of the pancreas. An enlarged duodenal curve is characteristic of enlargement in the region of the head of the pancreas. So too, displacement of the duodenum and the small intestine points toward the diagnosis of cyst of the pancreas.

The preoperative diagnosis was cyst of the pancreas in 4 cases and carcinoma of the pancreas in 2. In the remaining cases the preoperative diagnosis was retroperitoneal tumor, omental or pancreatic cyst, ovarian cyst or fibromyoma of the uterus, peptic ulcer, acute pancreatitis, acute cholecystitis, chronic appendicitis, and retroperitoneal sarcoma or cyst of the pancreas. The pathological picture presented at operation is characteristic. The large cyst arising from the region of the pancreas is so striking that one can scarcely fail to diagnose the condition at operation after having once viewed the lesion. The tumor usually presents itself as a smooth, relatively immobile, hemispheric, and semifluctuant swelling which arises in the region of the pancreas. The size of the tumor in this series varied from 5 to 30 cm. in diameter.

The existence of pancreatic secretions in the cyst has been frequently noted. On the other hand, numerous instances of true cysts are on record in which no ferments were found. Therefore, the absence of ferments appears to be of relatively little value to confirm or exclude the diagnosis of pancreatic cyst. Chemical analysis of the aspirated fluid in the authors' series revealed that 10 of the examined specimens showed the presence of trypsin, amylase, or of both. In 6 instances no chemical analysis was done, and in the case of pseudocyst with carcinomatous changes no enzymes could be found in the aspirated fluid. Some of the cysts also contained mucus, fat, bile, and lipase.

The choice of operation depends on the size, variety, location, and condition of the cyst. The ideal treatment is complete removal, if possible. Small cysts, especially when in the tail of the pancreas, should be excised. In cases in which the cyst is large and adherent, marsupialization of the tumor is believed to be the method of choice.

JOSEPH K. NARAT, M.D.

MISCELLANEOUS

Miller, J. M., and Wakefield, E. G.: Congenital Anomalies of the Primary Midgut Loop. *Am. J. Digest. Dis.*, 1942, 9: 383.

The various stages of development whereby the intestinal tract of man is transformed from a straight tube to the usual adult shape and position have been studied elaborately by the anatomist. These studies are of inestimable value to the surgeon and the physician in coping with the problems presented by congenital deviations from the usual pattern. Because of the intricate, yet paradoxically simple, process that the primary midgut loop undergoes in arriving at the normal adult stage, many opportunities for arrested development are present. These accidents of development may be grouped conveniently as (1) partial or total exomphalos or hernia into the umbilical cord, (2) complete or partial persistence of the vitelline duct, (3) anomalies of position or so-called malrotation of the midgut loop, (4) abnormalities resulting from traction bands, (5) inadequate fixation with a resultant narrow mesenteric pedicle permitting torsion to occur, and (6) incomplete peritoneal fusion resulting in defects and apertures in the mesentery.

A few of the more important anomalies which the primary midgut loop may present are illustrated by case histories. It is essential to note that many of the abnormalities which caused symptoms were accompanied by one or more "silent" anomalies.

Many of these congenital deviations do not cause symptoms *per se*, but are discovered only through roentgenographic studies or on laparotomy for an unrelated condition. This statement is true especially of the paraduodenal hernias. Congenital anomalies must be recalled when an explanation for a chronic digestive disorder is sought.

MacFee, W. F.: Pilonidal Cysts and Sinuses. A Method of Wound Closure. *Ann. Surg.*, 1942, 116: 687.

The postoperative wound of a pilonidal cyst or sinus may take weeks or months to heal. In the Army a soldier must remain in the hospital until the wound is completely healed, during which time he is disabled for active service and, in addition, he becomes a liability to his government. Therefore, a shortening of the healing time is desirable.

The two principal theories concerning the origin of this disease concede its congenital nature. According to the first theory, pilonidal cysts are derived from imperfect involution of the epithelial cells that participate in the formation of the embryonal medullary canal and its surrounding neural tube. Normally, the caudal part of the canal and tube become almost entirely obliterated during intrauterine life and are represented at birth by the filum terminale. The epithelial cells of the caudal end of the neural tube may persist to adult life and give rise to pilonidal cysts and sinuses. This theory is supported by the fact that sinuses in the sacrococcygeal region become the route of infection for meningitis.

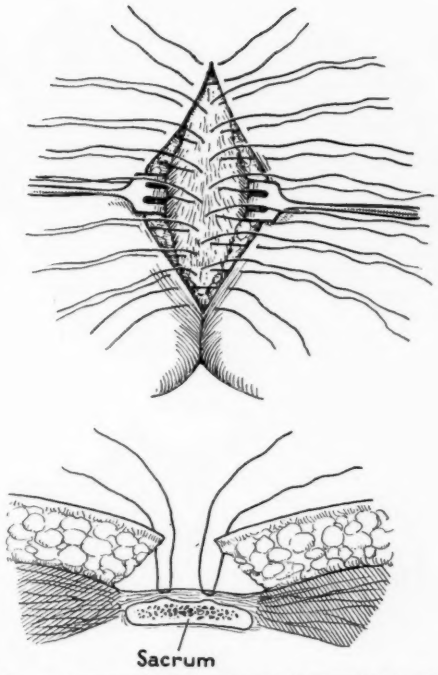

Fig. 1. Sutures of black silk placed through skin edges and fascia ready for tying, viewed from above and in cross-section. In passing sutures through skin the subcutaneous fat is not included. (Courtesy of J. B. Lippincott Co.)

According to the second theory, pilonidal sinuses and cysts are derived from the skin through a process of invagination during intrauterine life. There has been evidence to support both theories.

There is a preponderance of pilonidal cysts among young adult males. The ratio of males to females is approximately 3 or 4 to 1. Concerning the incidence of the disease, Kooistra found that of 313,285 patients 350 of them had pilonidal cysts. Usually the sinus or cyst gives no trouble before puberty. The disease belongs almost exclusively to the white race. Since the people of the yellow, brown, and red races have little hair on their bodies, this may be a factor in the absence of the disease.

It is believed by some that trauma and injury are not important factors in the etiology, but one is impressed by the many cases coming from the mechanized units which have few seat cushions.

The lesion consists of a single sinus or of multiple midline sinuses leading to one or more cystic cavities situated in the subcutaneous fat and fibrous tissue. The external opening is situated caudal to the cyst and a probe can be passed obliquely in an anterior and cephalic direction. Some of the tracts have ramifications.

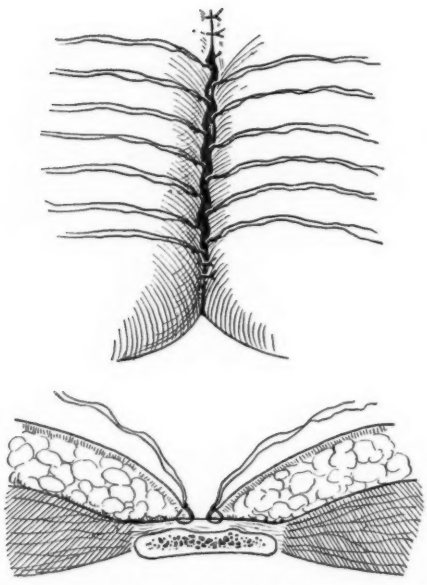

Fig. 2. Sutures tied, bringing skin edges to fascia near midline without tension.

There is some degree of infection in the majority of the cases and a history of abscess or drainage from the sinus. One-half of the patients in this series gave a history of one or more abscesses which had been incised or had ruptured. The infection rarely gives rise to bacteriemia.

The treatment consists of the removal or destruction of the tissues that make up the sinus or cyst, especially the epithelial elements. There are two methods, one is a direct attack on the sinus, the other attempts to encompass and remove the tissues which contain the sinus. Either method is acceptable, but recurrence and persistence are common. Thirty-two of the 214 patients, or 15 per cent, had previously been operated on for the disease. There were 230 operations performed on these 214 patients for pilonidal sinus.

A destructive chemical or cautery is usually used in the direct attack upon the sinus. Cautery excision gives very good results, particularly with respect to the diminution of recurrences. The majority of surgeons excise the sinuses with varying amounts of the surrounding tissue. Primary closure, open packing, and a number of modifications of these basic methods have been used, but few are satisfactory with regard to recurrence or the healing time. The principal drawbacks to primary closure are the constant presence of infection and the difficulty in obliterating the dead space. To overcome these disadvantages Ferguson and Mecray defer operation until infection is controlled, and after the excision a careful closure which includes the use of retention sutures of alloy steel wire is effected. The patient is then placed on his back on a litter or operating table for an hour to insure obliteration of any residual dead space. Gage defers the operations for six months after the infection has cleared up. He uses fine silk ligatures, does a primary closure, and applies a sea sponge under pressure to maintain the obliteration of the cavity. Colp described a method of primary closure in which the flaps are mobilized, by undermining if necessary, and then sutured separately to the midline of the posterior sacrococcygeal ligament by interrupted mattress sutures of silk. The wound frequently fails to heal per primam and often there is drainage which is persistent, and recurrence. It is very difficult to compare the results of primary closure with the open method as the statistics of the different investigators do not agree. The same is true for the healing time.

The type of wound closure about to be described has for its principal purpose the elimination of as much of the open wound as possible without the creation of a dead space. The tissue involved by the sinus is removed in the usual manner by block dissection, and partial wound closure is effected by suturing the skin edges to the sacrococcygeal fascia and underlying ligamentous structures. The skin edge on each side is brought as near the midline as possible without tension, and sutured with interrupted medium black silk, a narrow uncovered area

TABLE I.—THE RESULTS OF SURGICAL TREATMENT IN 230 CASES OF PILONIDAL SINUS

Type of wound closure	No. of cases	Average postop. days in hospital	Average healing time, in days	Cured		Persistence or recurrence		Result unknown or incomplete	
				No.	Per cent	No.	Per cent	No.	Per cent
Suture of skin edges to sacrococcygeal fascia	147	14	69 (89 cases)	97	66.	19	12.9	31	21.1
Packing of open wound	36	25	118 (26 cases)	26	72.2	6	16.7	4	11.1
Primary suture	34	14	70 (23 cases)	22	64.7	11	32.3	1	2.9
Incision and drainage	12	7	153 (3 cases)	6	50.	2	16.7	4	33.3
Unclassified	1					1			

of fascia between being left. If this area is large enough to warrant it, a skin graft may be applied to further shorten the healing time. A roll of gauze or cotton wet with normal saline solution is then applied to the wound, where it may be conveniently anchored by means of the suture ends which are left long to facilitate their subsequent identification and removal. If the wound can be kept clean it need not be disturbed for several days, but the dressing may be changed frequently if necessary. The sutures should not be removed until the skin has become firmly fixed to the fascia. This is usually a matter of ten or twelve days.

The results of the various procedures are shown in Table I.

The initial results of this method of partial closure which is used to reduce the healing time are encouraging, but the ultimate value of the method depends upon further experience with it. The postoperative care is important, both with respect to the healing time and recurrence. ALFRED B. LONGACRE, M.D.

Ariel, I., Pack, G. T., and Rhoads, C. P.: Metabolic Studies in Patients with Cancer of the Gastrointestinal Tract. *Ann. Surg.*, 1942, 116: 924.

Biopsies of the liver tissue were obtained at the beginning and at the termination of operation from 13 patients submitted to gastric surgery. Eight of the patients had cancer and 5 had non-neoplastic diseases of the stomach. There were 11 subtotal gastrectomies, 1 total gastrectomy, and 1 gastroenterostomy. The patients were given morphine sulfate, scopolamine, and nembutal before operation. Spinal anesthesia, occasionally supplemented by inhalation or intravenous anesthesia, was used. All patients received intravenous fluids or blood during operation. The operating room was air-conditioned and maintained at a temperature of 78° F., and 50 per cent humidity.

Comparison of the chemical analysis of specimens taken at the start of operation with that of specimens taken at the completion of operation revealed that certain metabolic alterations in the liver had occurred during major gastric surgery.

There was an average increase of 1.1 per cent in the total water content of the liver. This suggests that intravenous administration of fluids during operative procedures compensates for fluid loss.

There was a shift of fluid from extracellular to intracellular position in 7 patients. The reverse occurred in 5 patients.

The average loss of liver glycogen during operation was 45 per cent of the total liver glycogen content. No correlation existed between the intracellular water alteration and changes in the glycogen content. This indicates that the glycogen loss is real and not due to hydration.

Hepatic lipid content was increased in 7 cases and decreased in 4 cases. The average alteration was an increase of 1.97 gm. per cent.

The total protein in the liver was increased an average of 1.1 gm. per cent in 4 patients, decreased an average of 1.1 gm. per cent in 6 patients, and unaltered in 1 patient. There was an increase in hepatic albumin, usually associated with a decrease in globulin, during the operation in 8 cases. In 2 cases the albumin decreased and in 1 case it was unchanged. EDWARD W. GIBBS, M.D.

GYNECOLOGY

UTERUS

McLennan, C. E., and McKelvey, J. L.: Conservative Treatment of Inversion of the Uterus. *J. Am. M. Ass.*, 1942, 120: 679.

Inversion of the uterus apparently occurs more often than suggested by the usual figures for its incidence quoted in obstetrical textbooks. The mortality rates associated with inversion are excessively high. Improvement in the end-results has been demonstrated to follow the use of conservative management. This consists of (1) vigorous antishock treatment, (2) disregard of the uterus itself in the acute stage other than the control of bleeding and infection, and (3) the surgical correction of the abnormal uterus some weeks later.

Immediate attention should be focused on the general reaction of the patient. Shock must be anticipated even if not already present. Multiple blood transfusions are usually required. When blood is not immediately available plasma or serum are excellent temporary substitutes. No procedure which will tend to increase shock should be employed at the time of occurrence or discovery of the acute inversion. Deep surgical anesthesia and forceful attempts at replacement are contraindicated. The inverted uterus may be left untouched unless bleeding requires the application of a tight vaginal pack. For the patient who is clearly not in shock and for whom blood has been made available, it may be permissible to undertake a single minor attempt at manual replacement of the uterus. If the placenta has not been expelled it should be left *in situ* for from twenty-four to forty-eight hours. Systemic chemotherapy with sulfonamide compounds should be instituted at once. Local infection may be reduced to a minimum by the daily application of antiseptic vaginal packing.

After from four to six weeks, the now well involuted uterus may be restored surgically to its normal position, or it may be removed. The exact time for operation may be controlled by endometrial biopsy or the disappearance of gross evidence of infection. When the patient's childbearing is complete or when sterilization is desirable the procedure of choice is vaginal hysterectomy under local anesthesia.

HENRY C. FALK, M.D.

Carter, B.: A Bacteriological Study of Pyometra. *Am. J. Obst.*, 1942, 44: 1074.

Aerobic and anaerobic cultures of the pus from 39 patients with pyometra were made. Aerobic cultures were made of the pus from 6 patients with pyometra, and no growths were obtained in 3 cases. The high incidence of anaerobic organisms in pelvic infection made incomplete the studies in which only aerobic cultures were done.

From analysis of this small series no definite conclusions can be drawn. Since anaerobic organisms capable of invading the cervix and uterine cavity are found normally in the vaginas of postmenopausal women in a higher incidence than in the vaginas of childbearing women, the possibility of endogenous infection must be considered. When nonhemolytic streptococci, diphtheroid bacilli, the streptococcus viridans, staphylococcus albus, and bacilli of the colon group are cultured in pyometra, endogenous infection may be predicated. On the other hand, the culture of the streptococcus hemolyticus (especially Group A) and staphylococcus aureus, neither of which is commonly found in the vagina, argues against endogenous infection.

Whether infection is necessary in the production of "spontaneous" and "operative" pyometra can be determined only by careful culture of a large number of cases of pyometra. In this small series sterile pyometra occurred most commonly in uteri with adenocarcinoma and in uteri with squamous-cell carcinoma of the cervix before and after irradiation therapy. No culture was sterile in the "spontaneous" cases of pyometra.

EDWARD L. CORNELL, M.D.

Teahan, R. W., Wammock, H., and Weatherwax, J.: Carcinoma of the Cervix. *J. Am. M. Ass.*, 1942, 120: 423.

A method of interstitial and intracavitary irradiation supplemented by external roentgen radiation is presented for the treatment of carcinoma of the cervix. In the patient of average size an amount of radiation considered cancericidal reaches the lateral pelvic wall without increasing the dosage at and immediately adjacent to the cervix to such a point that necrosis of tissue is produced.

Following biopsy and examination, external radiation is applied daily, anteriorly and posteriorly, until the skin shows definite irradiation effects. Four weeks after completion of treatment the abdomen is explored through a midline incision under general anesthesia. If any enlarged glands are found in the iliac region they are removed. Both tubes and ovaries are extirpated. With the patient in lithotomy position, a bimanual examination is then made with the left hand grasping the uterine fundus while the fingers of the right hand are inserted into the vagina to determine the extent of the involvement and plan the distribution of the radium.

The external cervical os is gently dilated to admit the intrauterine applicator which is inserted after the radium needles have been implanted. Generally, 9 or 10, 1 mgm. radium needles are placed at the periphery of the cervix parallel to the cervical canal and approximately 1 cm. apart. A rubber tube containing from 2 to 4 radium tubes in tandem is placed in the cervical and uterine canal. Following packing of the vagina, the gowns and gloves are changed and the abdomen is closed. A roentgenogram is made to

ascertain the position of the radium containers. The radium is left in position for approximately two hundred and sixty hours.

Since the year of 1933, 52 patients with carcinoma of the cervix, some with extensive disease, have been treated. There was no operative mortality, and few complications, except delay in wound healing of some incisions, occurred. Of the patients so treated, 23 are dead; 15 died within one year of treatment, 7 died between one and two years of treatment, and 1 lived three years. Twenty-nine are still living. Of these, 1 is alive and well after more than eight years, 3 are well after four years, and 10 have been well for a period of one year or more. Fifteen patients are living less than one year following treatment.

The authors now use this method in all cancers of the second and third stages, and in some of the fourth stage. HENRY C. FALK, M.D.

Gemmell, A. A.: Some Factors in the Prognosis in Carcinoma of the Cervix. *J. Obst. Gyn. Brit. Empire*, 1942, 49: 453.

The results achieved in the treatment of 151 cases of carcinoma of the cervix between 1929 and 1937 are recorded:

Stage of Disease (League of Nations Classification)	Number treated over 5 years ago	Alive at 5 years (per cent)
Stage I	13	53.8
Stage II	32	21.9
Stage III	34	23.5
Stage IV	10	....
All Cases	89	24.7

Various factors in prognosis are considered and an attempt is made to assess their value:

1. Stage of the growth—League of Nations classification. This is a valuable index of prognosis as is obvious from the table of results.

2. Cystoscopic appearances

a. The more serious appearances in the bladder are found in association with the more extensive stages of the disease, as would be expected.

b. The survival rate of patients with transverse ridging or edema is roughly half that of patients with no changes in the bladder or only minor changes.

3. Sigmoidoscopic appearances

a. Sigmoidoscopy has given information in case of Stage III or IV only.

b. The changes noted by sigmoidoscopy were few, and possibly digital rectal examination would have given information similar to that obtained by use of a sigmoidoscope.

c. Approach of the growth toward the rectum is of serious prognostic import and affords some information of the expectation of life.

4. Treatment was by radium application with the technique in vogue at the Radiumhemmet in Stockholm, plus deep x-ray therapy. Variation in the dosage of radium within fairly wide limits does not affect the prognosis.

5. Histological appearances. Classification of growths from material obtained by biopsy is of no assistance in determining the prognosis.

6. Colloidal vanadate reaction (Bendien reaction)

a. Observations are made on graphic records of repeated observations of this test during the "follow-up" period.

b. Patients who have a low value for this test before treatment have a significantly lower survival rate than those in whom the value is in the normal zone.

7. Age. The age of the patient at the time of treatment is not a guide to prognosis.

8. Number of children and number of pregnancies. These facts about a patient do not form any guide to prognosis.

9. Duration of symptoms prior to treatment. Contrary to the author's expectation, this observation was no guide to prognosis in this series of cases, but comparison was made only between those patients who had had symptoms for six months or less, and those who had had symptoms for a longer period.

10. Coitus after treatment. Attention is drawn to this factor, but the available evidence is too small to form any conclusion.

11. Stump carcinoma. The prognosis in true stump carcinoma is approximately the same as when the whole uterus is intact.

12. Appearance of disease in relation to pregnancy. When the disease appears within two years of pregnancy the prognosis is not affected.

13. Statistical testing. In many parts of this article the value of the figures has been submitted to statistical test. The results, which have been surprising in some instances, seem to emphasize the necessity for such tests whenever attempts are made to draw conclusions from figures.

DANIEL G. MORTON, M.D.

EXTERNAL GENITALIA

Latzko, W.: Postoperative Vesicovaginal Fistulas; Genesis and Therapy. *Am. J. Surg.*, 1942, 58: 211.

Of 97 vaginal fistulas seen over a period of thirty years, 65 were postoperative in origin. The basic operation was for carcinoma of the cervix in 36 cases; for myoma uteri in 14 cases; for other gynecological diseases in 14 cases; and for carcinoma of the sigmoid with resection of the bladder in 1 case. The occurrence of vesicovaginal fistulas following radical hysterectomy for uterine carcinoma is unavoidable within certain limits insofar as it represents a sequela of intentional or unavoidable injury, or the end-results of gangrene of the bladder caused by interruption of its vascular and nervous supply. The fistulas which followed operation for myoma were not originally operated upon in the author's clinic.

The difficulties in the management of postoperative vesicovaginal fistulas are the inaccessibility of the fistula and the impossibility of mobilization.

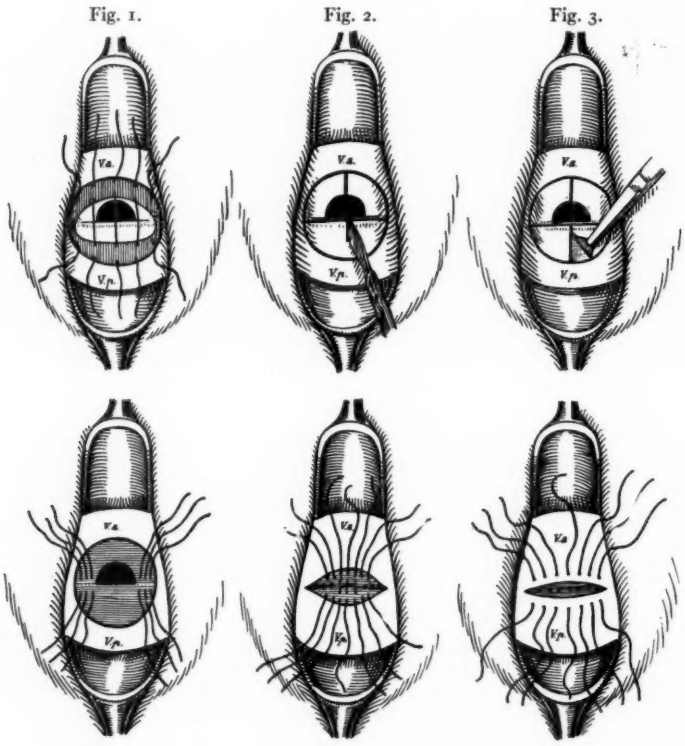

Fig. 1. Simon's colpocleisis. *V.a.*, anterior vaginal wall; *V.p.*, posterior vaginal wall. A ring of vaginal mucosa is denuded and sutured to leave an area of vaginal mucosa close to the fistula which becomes a diverticulum of the bladder.

Fig. 2. Diagrammatic representation of the first step in the obliteration operation. A circular area of vaginal mucosa is denuded for a distance of 1¼ cm. from the fistula opening.

Fig. 3. Diagrammatic sketch showing denudation carried out in four quadrants. No vaginal mucosa is allowed to remain between the edges of the incision and the fistulous opening.

Fig. 4. Drawing showing raw surfaces on both sides of the fistula united by sagittal sutures, the fistulous opening being brought in contact with the posterior vaginal wall.

Fig. 5. First layer of sutures tied; second layer of sagittal sutures inserted to close the fistulous opening and bring the raw surface of the bladder in contact with the anterior wall of the rectum.

Fig. 6. Closure of margins of the vaginal wound. (Courtesy of Am. J. Surg.)

The posterior margin of the fistula corresponds with the scar in the vault of the vagina. This makes mobilization of the bladder and its suture extraordinarily difficult. The bladder and rectum are adherent and in the dissection the free peritoneal cavity is frequently opened. There is also danger of injury to the ureters, which following radical hysterectomy, are ensheathed by the scar.

These difficulties have caused many authors to abandon the vaginal route of operation and attempt the closure of the bladder defect by the suprapubic route. The transvesical extraperitoneal route is used especially by urologists. However, in fat women the field of operation is relatively inaccessible and the transvesical opening of the bladder may be very difficult if the bladder capacity is substantially reduced as is usually the case in long-standing fistulas.

Individual authors have obtained excellent results with the transperitoneal operation, which consists of laparotomy and separate suture of the blad-

der and vagina. The relatively high mortality from transperitoneal-fistula operations as well as the technical difficulty of the other suprapubic methods should argue in favor of the vaginal approach.

The author describes a modification of Simon's colpocleisis as the simplest and surest procedure for vesicovaginal fistula following hysterectomy.

The lithotomy position is used. If the fistula is inaccessible, an episiotomy or Schuchardt's incision is made to expose the fistula. Because of the anatomy of the parts, the upper or posterior edge of the fistula always coincides with the transverse firm scar in the vault of the vagina. A circular area of vaginal mucosa is denuded from both the anterior and posterior vaginal walls, for a distance of 1½ cm. from the fistula opening, all vaginal mucosa up to the opening of the fistula thus being removed (Figs. 2 and 3). No vaginal mucous membrane is allowed to remain between the edges of the incision and the fistulous opening.

Sagittal sutures are now placed from above downward to coapt the raw surfaces on either side of the fistulous opening (Fig. 4). This is the only difficult part of the procedure as the lateral denuded areas often retract as a result of the pull of the scar. The posterior portion of the fistula is now closed (Fig. 5). The remaining segment disappears after the second row of sagittally placed sutures are tied (Fig. 6). Closure of the anterior and posterior margins of the vaginal wound terminates the operation. The suture material used is plain catgut throughout.

The following conditions must be fulfilled if the operation is to be successful: (1) previous total hysterectomy; (2) adequate length of the vagina in order to be sure of an organ that is fit for cohabitation after the loss of 1.5 cm.; and (3) situation of the fistula at the uppermost end of the vaginal funnel. In 31 cases of postoperative vesicovaginal fistulas in which obliteration or occlusion of the vaginal vault was performed there were 2 failures, 1 of which was the result of a serious technical error on the part of an inexperienced operator. All of the remaining 29 patients were cured by a single operation.

A detailed tabulation of cases and excellent bibliography are presented. HENRY C. FALK, M.D.

MISCELLANEOUS

Schneider, P.: The Problem of the "Tubal Sphincter" and of the Intramural Portion of the Fallopian Tube. *Am. J. Roentg.*, 1942, 48: 527.

In 22 operatively removed uteri the occurrence of a "tubal sphincter" or shadow-narrowing phenomenon, has been demonstrated.

For various reasons, above all because of a complete morphological agreement with the roentgenograms obtained from the living uterus, the anatomical conditions which form the basis of these views in the dead uterus were considered identical with those in the living uterus.

The anatomical basis and topography of the shadow-narrowing phenomenon has been discussed. It has been shown that it is not a sphincteric contraction or a muscular contraction at all, but rather a fold formation of the mucous membrane of the corpus at the transition between corpus and tube. Consequently, the portion of the shadow situated lateral to the shadow-narrowing phenomenon, the identity of which was previously problematical, has been recognized as belonging anatomically to the pars intramuralis.

On the basis of the anatomy and histology of the dilated portion of the tube, it is possible to delimit this section from the remaining portions and justify its designation as antrum tubae.

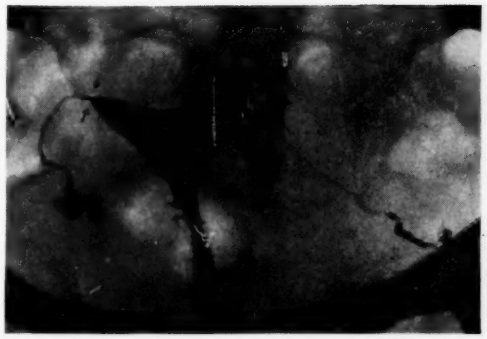

Fig. 1. Normal hysterosalpingogram with bilateral "sphincter" phenomenon.

Fig. 2. Frontal section through the uterotubal horn.

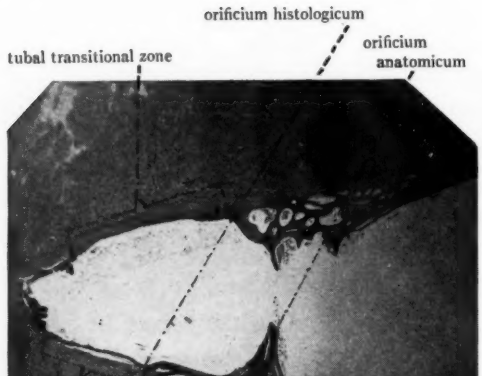

Fig. 3. Photomicrograph of frontal section through the uterotubal horn.

For the examination of functional processes at the uterotubal transitional area a method of investigation is proposed which consists of a combination of filling the artificially surviving uterus with a contrast medium, roentgenoscopic observation, and the taking of serial hysterosalpingograms.

Figures 2 and 3 indicate the true reason (a mucosal fold) for the shadow-narrowing phenomenon which is so commonly observed and is illustrated in the first figure. DANIEL G. MORTON, M.D.

Rutherford, R. N.: Presacral Neurectomy. A Gynecological and Obstetrical Follow-Up. *West. J. Surg.*, 1942, 50: 597.

Critical evaluation of the long-term end-results of presacral neurectomy (excision of the superior hypogastric plexus) is made by the author. The use of this procedure as the final weapon in the treatment of primary dysmenorrhea has been under investigation for more than a medical generation. The authors briefly review the development of presacral neurectomy, the anatomy and physiology involved, and the actual procedure of operation. The causes of dysmenorrhea are described briefly, but no further discussion of the cause of primary or essential dysmenorrhea is made. The series of cases reviewed in the past includes 23 patients, 20 of whom had presacral neurectomy and other indicated procedures for primary dysmenorrhea, and 3 of whom had the operation for endometriosis with its secondary or acquired dysmenorrhea. A two-year follow-up study has been made in all 23 cases, and the obstetrical histories of 8 of the 23 who have undergone pregnancy are presented in detail.

Little disorder of function is found as a result of an operation which gave 100 per cent relief in 13 cases (10 of primary and 3 of secondary dysmenorrhea), 75 per cent relief in 6 cases, and 50 per cent relief in 4 cases—an over-all result of 85 per cent relief following the procedure. This is in close agreement with Pemberton's report from this clinic in 1935, citing an 80 per cent relief and 7 per cent partial relief in 15 cases of primary dysmenorrhea treated surgically. In 17 cases with pelvic pain secondary to overt pathology, he reported cure in 65 per cent and partial relief in 24 per cent.

The obstetrical follow-up in 8 cases is given in brief abstract. No disorder of function is found as a result of the operation. Labor pains were absent during the first stage of labor in 5 of the 8 cases, and absence of pains during the greater portion of the first stage of labor in 2 other cases (in 1 of these cesarean section was done for bony disproportion). Pain occurs normally as descent of the head is begun.

Objections to the procedure on the basis of change in libido, change in flow, change in response to intercourse, change in bladder or bowel function, or later sequelae are without statistical proof in this small series.

The author notes that the procedure is one of last resort after more conservative measures fail, and should be combined with other indicated pelvic procedures if pathology is found. Three cases of acquired dysmenorrhea secondary to endometriosis were treated conservatively by neurectomy, suspension of the uterus, and excision of the local implants. Subsequent obstetrical history of 2 of these cases is made available. HERBERT F. THURSTON, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Weisman, A. I., Snyder, A. F., and Coates, C.: The Use of the African Clawed Frog (Xenopus Laevis Daudin) As a Rapid Diagnostic Test for Pregnancy. *West. J. Surg.*, 1942, 50: 557.

In a previous report the authors presented a series of 53 unknown urines for a diagnosis of pregnancy using the "frog test"—the African clawed frog. This series proclaimed the frog test as 100 per cent accurate.

The present report concerns a series of 267 additional tests, 154 of which were run parallel with the rabbit test and 113 were performed without a parallel test but subsequently checked by physical findings and by means of x-rays. In the 154 cases the test was positive in all of the rabbits but in only 146 of the frogs. There were 6 discrepancies which on subsequent study revealed the rabbit test to be in error in each instance. Thus, the frog test was 100 per cent accurate and the rabbit test 96 per cent correct. One hundred thirteen additional cases were then tested by means of frogs alone. An accurate diagnosis was made in 112 instances, an accuracy of 99.6 per cent. The error was made in a woman seven days past her menstrual date. A subsequent test one week later then indicated a pregnancy.

This test is based on the fact that the mature African clawed frog carries eggs throughout the year and extrudes them only at mating or on injection of pregnancy hormones.

The authors describe the technique of the test and care of the test animals in detail. Since these animals may be re-used, it is necessary to keep them segregated into three groups; those frogs who are recuperating for four weeks following a "positive reaction"; those resting for one week that have not reacted (negative); the active group from which animals ready for use are taken. The test is made in the usual two-gallon fish tank which contains a platform of ½ in. wire mesh, to prevent the frog from devouring its own eggs. It should contain about 3 in. of water kept at 70° F. Whole urine may be used although for a more rapid test it may be concentrated by extraction with acetone followed by filtration. The filtrate is then dried. The soluble hormone is then separated from the insoluble proteins by adding water and centrifuging. One cubic centimeter of the clear fluid is then injected into the dorsal craniolumbar lymph space. Great care must be exerted to prevent puncture of the lung which means the death of the animal. Extrusion of ova up to eighteen hours after injection means the test is positive. The animal must then be rested for four weeks. If, after eighteen hours, no eggs are visible the test is to be considered negative and the animal must be rested for one week.

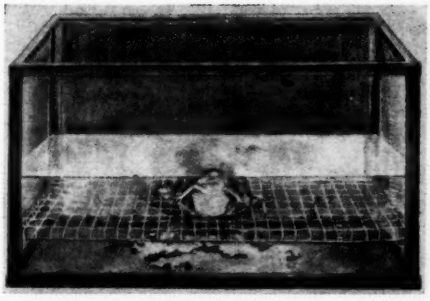

Fig. 1. Positive Xenopus reaction with pregnancy urine.

As pointed out by these investigators this test has several advantages: (1) it is rapid; (2) it is extremely accurate; (3) it is simple to perform; (4) the animals are easily obtained and maintained; (5) it is inexpensive; and (6) the method of reading is simple.

JOSEPH E. FIELDS, M.D.

Eastman, N. J., and Whitridge, J., Jr.: The Prevention of Toxemia of Pregnancy. *J. Am. M. Ass.*, 1942, 120: 729.

The incidence and maternal mortality of eclampsia is declining. At the Johns Hopkins Hospital the incidence has dropped from 25 to 50 per cent during the last four decades, and the maternal mortality has fallen 20 per cent below that of the early years of the century. The disease also accounts for a much smaller percentage of the total number of cases of toxemia. This is true not only at this clinic but the country over wherever good antipartum care is available. Where good care is not available, the incidence of eclampsia has remained stationary.

The most important factor in the prevention of toxemia in eclampsia has been the early detection and appropriate treatment of the prodromal stage, pre-eclampsia. The patient must have frequent prenatal visits. At this time the blood pressure should be taken. A sudden rise in blood pressure cannot be overemphasized. The sudden appearance of albuminuria should always be regarded as a sign of impending toxemia. Another constant sign is sudden excessive gain in weight. Other important prodromes are: (1) severe headache, (2) edema of the face and fingers, (3) blurring of vision, (4) vomiting, (5) decrease in the urinary output, and (6) epigastric pain.

In the face of these warnings the patient should have absolute bed rest with a salt-free, high protein diet. Sedation should be administered, the dosage depending on the severity of the condition. The blood pressure and urinalysis should be read each day if possible. If a satisfactory response is obtained

the pregnancy may be allowed to proceed, but with the patient under constant careful observation. If the progress of the disease continues unabated, termination of the pregnancy becomes the treatment of choice. This may be done by one or two methods: induction of labor followed by a vaginal delivery, or cesarean section. It is often difficult to decide which method is preferable.

During the early years of the century the treatment of eclampsia was governed by the belief that immediate delivery was imperative, even by operative means. The mortality rate was about 20 per cent. During the last two decades the conclusion has been reached that radical operative treatment is deadly to eclamptic patients, since the patient is a poor operative risk and remains so as long as she is in the active convulsive stage. Conservative treatment with the use of sedation and hypertonic solutions has cut the mortality to about 5 per cent.

Whereas the incidence of eclampsia is declining, the frequency of all types of toxemia is increasing. This is due largely to the fact that women with chronic hypertensive processes are becoming more and more of a problem. At the present time large numbers of women with chronic hypertension are becoming pregnant and dying each year.

The problem presented by chronic hypertension in pregnancy is quite different from that of eclampsia and pre-eclampsia. We cannot prevent the hypertension because it has already been present when conception took place and we can do little in such cases to relieve it. But one can aid by helping to prevent or limit the number of pregnancies.

Proper treatment depends on the severity of the process. If it is mild, the pregnancy may be allowed to progress. If the process is severe, the pregnancy should be terminated regardless of the stage of pregnancy.

Our weapons in dealing with chronic hypertension in pregnancy are: (1) prevention of pregnancy, (2) interruption of pregnancy, if necessary, and (3) sterilization at the time of delivery or after delivery. The problem these patients present is becoming one of the most frequent and is one of the most serious in modern obstetrics.

JOSEPH E. FIELDS, M.D.

Bottiroli, E.: Hematomas of the Umbilical Cord (Hematomas del cordón umbilical). *Rev. méd. Rosario*, 1942, 32: 769.

If hemorrhage due to rupture of a large varicosity or an aneurysm of the umbilical vein is excluded, hematoma of the cord is an extremely rare complication of pregnancy and labor. It is caused by rupture of the vascular wall with intactness of the amniotic covering of the cord, at least until a considerable amount of blood has accumulated in the Wharton gelatine. Death of the fetus in these cases is due to partial or complete compression of one or more umbilical vessels. Only 36 cases have been reported in the literature until 1938; they showed no relationship to age, parity, duration of pregnancy, or presentation. The immediate fetal mortality was 47 per cent; 7 fetuses were macerated and 10 died during the first or second stage of labor.

Absolute or relative shortness of the cord has often been cited as a factor in the development of hematoma. The ruptured vessel was mentioned in 32 cases; it was the vein in 28 and the artery in 4. The hematomas were generally located close to the umbilicus and were usually single. They varied greatly in size, some reaching the thickness of the arm of the fetus, and their lengths ranged from 4 to 42 cm. Their shape was usually fusiform, and some had the aspect of gangrenous intestine. The cause of rupture of the vessel could not always be established; in rupture of the artery some anomaly of the wall was always found on histological examination; in rupture of the vein, a small varicosity was observed at the site of injury in several cases; in 1 case the resistance of the wall of the vein had been impaired by icterus. Couvelaire has incriminated mechanical traumatism of the cord caused by its making a turn around the neck of the fetus which results in partial obstruction of the vessel and increase in venous pressure. In general, when there is no apparent cause for the rupture of the vein, the unequal pressure inside and outside of the vessel, following evacuation of the amniotic fluid, is held responsible for the accident; however, this explanation does not apply to all cases, because hematoma has been observed in cesarean section in which the membranes were intact.

Mechanical forces probably play an important role: most ruptures close to the umbilicus may be due to traction on a short cord during the descent or expulsion of the fetus or to movements of the fetus with a turn of the cord around the body or extremities. To this must be added the increase in venous pressure when the placental blood is forced into the umbilical vein during uterine contractions. The diagnosis of hematoma of the cord cannot be made before delivery, but may be suspected from signs of fetal suffering.

The author reports 2 cases which he has observed in the past four years. In the first, no definite cause for the rupture of the vein could be found; in the second, there were signs of hereditary syphilis and the Wassermann test of the mother was frankly positive: therefore, syphilis was regarded as the causal agent in the production of the hematoma.

RICHARD KEMEL, M.D.

Wright, S. W.: Three Cases of Locked Twins. *Lancet*, Lond., 1942, 243: 212.

There are five ways in which locking or collision of twins may happen. The fetuses are usually small or the pelvis is very large.

1. The fetuses both presenting by the vertex, their heads enter the pelvis side by side and become arrested. A case of this type was reported by Commandeur and Eparvier in 1923. They published a photograph showing the manner in which the head of the second twin fitted the neck and shoulder of the first.

2. The first child presents by the breech, the second by the vertex and the heads either become impacted in a manner similar to that of the previous type or become locked by the chins. Rarely, spontaneous delivery may take place.

3. The breech of the second child, with the legs flexed, enters the brim at the same time as the thorax of the first child, also presenting by the breech, which prevents further progress of the first child whose head remains above the brim.

4. The first child presenting by the breech or the feet may become locked by the chin on the body of the second child, lying transversely. Natural delivery is impossible.

5. Both fetuses presenting as footlings may enter the pelvis together.

Three cases are reported in detail; they illustrate mechanism No. 2 twice and No. 3 once.

Predisposing factors are a large pelvis and relatively small fetal parts. Oligohydramnios of the second fetal sac may be important, it having been present in all 3 of the author's cases, and having been reported by Phillips in 1926 and Dawson in 1936.

DANIEL G. MORTON, M.D.

Richman, S., and Goodfriend, M. J.: Cancer of the Cervix Uteri Associated with Pregnancy. *Am. J. Roentg.*, 1942, 48: 677.

The co-existence of cancer of the cervix and pregnancy is uncommon enough to warrant reporting its occurrence. The diagnosis is not difficult if its possibilities are given proper regard and biopsies are performed. Cases are missed because bleeding in early pregnancy is dismissed as a threatened abortion and in late pregnancy as an accidental hemorrhages because an ultraconservative attitude prohibits examination needlessly. The authors report 4 cases in about 15,000 deliveries. Only 2 patients survived.

The authors ask the following pertinent questions: What is the effect of cancer of the cervix on pregnancy and how does pregnancy affect cancer? Is a normal delivery possible without extreme risk to the mother from hemorrhage or infection? Should these patients be subjected to surgery, and, if so, what should be its nature? Should irradiation be given with the fetus in utero? They believe that only by studying numerous individual case reports can one arrive at a conclusion and that the stage of pregnancy plays a decided role in the choice of treatment.

During the first trimester radium should be applied in as large amounts as possible, but for only eight to twelve hours in any one session. The action of the radium on infected bleeding carcinoma will usually cause healing in from four to six weeks. Since the abortion resulting from the roentgen therapy does not occur until this period of time has elapsed, the danger of sepsis and hemorrhage during the abortion is minimal. Roentgen therapy should be given alternately with the radium therapy. Several weeks after the abortion from roentgen therapy has occurred a radium tandem should be inserted into the uterus and the usual dosage given. Occasionally, there may be residual carcinoma after these procedures have been carried out. Implantation needles or radon seeds, or intravaginal roentgen therapy, may be used.

During the second trimester, treatment depends upon whether or not the uterus has already reached the size of a four and one-half months' gravidity. If the size of the uterus is less than this, treatment is carried out as in the first trimester. The more advanced stage of pregnancy makes abortion from roentgen therapy less certain. Abortion is advised if the uterus has not spontaniously emptied itself within from four to six weeks after treatment has begun. If the uterus is past four and one-half month's gravidity, radium is given through the vagina as in the first trimester. If delivery occurs within a few weeks, roentgen therapy is given as soon as conditions allow. Intrauterine radium therapy, as in the first trimester, is administered as soon as possible after completion of the roentgen therapy. If spontaneous delivery does not occur, one then awaits the moment when the life of the child may be assured. A simple cesarean section should be done with subsequent treatment as heretofore advised.

During the third trimester cesarean section should be done at the most opportune time compatible with the baby. If the patient is seen prior to this time, radium should be administered through the vagina as has been described. Following the operation, treatment should be carried out with roentgen irradiation and intrauterine radium, as in the latter part of the second trimester.

During the post-partum period, the usual procedure is to give roentgen therapy to the pelvis followed by intrauterine and vaginal radium treatments.

JOSEPH E. FIELDS, M.D.

LABOR AND ITS COMPLICATIONS

Moloy, H. C.: Studies on Head Molding During Labor. *Am. J. Obst.*, 1942, 44: 762.

This investigation draws attention to changes in the base of the skull, a region hitherto considered unaffected by the stress of labor. To demonstrate and magnify these changes, a compression binder was used to simulate the squeeze of labor.

The nature of molding seems to be as follows:

1. There is an increase in the sphenovertical and, to a lesser extent, in the maxillary-vertical diameters.
2. The sphenopetrous angle is made more acute through bending at the suture line existing between the sphenoid and basiocciput.
3. The occipital condyles are elevated.
4. The petrous portions of the temporal bone are elevated.
5. The occipital plate is elevated.
6. The vault of the skull, i.e., the occipital and parietal regions, is displaced forward.
7. The midpetrovertical diameter is constant because with compression the base of the skull behind the sella turcica is elevated and therefore a constant length to this diameter is maintained.

During extreme molding the midpetrovertical diameter remains constant. This observation is important since it would infer that this factor acts in a protective manner to avoid tension on the tentorium cerebelli. However, the author is concerned with a discussion of skull changes rather than with the influence of these changes upon intracranial mechanics. The concept of the mechanism of molding brought out by this investigation is that there is locking of the frontal and parietal bones at the coronal suture, and, to a less extent, of the occipital and parietal bones at the lambdoid suture. This mechanism of locking allows bending and displacement in the vault because there are compensating changes in the base. Basal changes consist of elevation of the occipital region with bending at the sphenopetrous angle.

Although this study is a part of the larger problem regarding the question of disproportion between the head and the pelvis, no constructive ideas regarding the estimation of head size have been developed. The changes observed are important enough to report in the hope that the observations may be confirmed by other workers.

The article is well illustrated by drawings and x-ray reproductions. EDWARD L. CORNELL, M.D.

Hingson, R. A., and Edwards, W. B.: Continuous Caudal Anesthesia during Labor and Delivery. *Current Res. Anesth.*, 1942, 21: 301.

Sixty-five labors and deliveries were managed in their entire course under continuous caudal anesthesia without resort to any other form of anesthesia. With this method, the drug, preferably metycaine 1½ per cent in physiological saline, bathes the nerve trunks of the sacral and lumbar plexi within the peridural space continuously.

The rationale of this method is based upon the anatomy of the nervous system of the uterus.

The technique of caudal injection is discussed in detail. A semiflexible, malleable, stainless steel needle is recommended. After the needle is in place it is securely attached to the 2 ft. semirigid rubber tubing which is connected to a Luer-Lok syringe. A diagram of the set-up facilitates the understanding of the mechanism. Anesthesia thus produced provides relatively comfortable labor and painless delivery for the mother.

The shortest duration of anesthesia was one hour and forty-five minutes, the longest, twenty-eight hours and thirty-eight minutes. The average length of time was six and one-half hours. The average total dose of metycaine was 2½ gm. The babies, without exception, cried vigorously at birth with no form of special resuscitation necessary.

Complications comprised broken needles in 4 cases, difficulty in inserting the needle into the sacral canal in a few cases, unilateral anesthesia in 4 cases, and a backache in some, and minor complaints in others.

The post-delivery course seemed freer of discomfort and complication than similar groups managed under different methods. MARY KARP, M.D.

Edwards, W. B., and Hingson, R. A.: Continuous Caudal Anesthesia in Obstetrics. *Am. J. Surg.*, 1942, 57: 459.

Continuous caudal anesthesia or extradural introduction of fractional doses of anesthetic substances through the sacral hiatus into the sacral canal, has been practiced at the U. S. Marine Hospital, Stapleton, Staten Island, New York, since January, 1942. This form of anesthesia is an improvement over the conventional peridural injection administered by a single injection. Its advantage is that the anesthesia can be safely prolonged for an indefinite period, which in the experience of the author has been as long as thirteen hours.

Under this form of anesthesia the patients are mentally and physically at ease and are able to bring to bear all the voluntary expulsive forces to cooperate completely with the accoucher. The symptoms of delirium, narcosis, cyanosis, nausea, vomiting, and anoxemia, so often seen with other forms of anesthesia, are constantly absent in these cases.

Spontaneous respiration of the infant followed in every case except 1, in which the delivery of a still born took place, the fetal death having been determined several days before delivery. In every case there was immediate and complete relaxation of the cervix and the pelvic floor, which expedited the progress of labor without interfering with uterine contractions. The technique consists of inserting a silver spinal needle into the sacral hiatus; the needle is attached to a syringe so arranged that the local anesthetic can be continuously injected. The initial dose is 30 cc. of a 1½ per cent metycaine solution in physiological solution. The anesthesia is prolonged by serial injections of the anesthetic solution at intervals and in amounts varying with individual cases. Most of the patients are comfortable if 20 cc. of additional anesthetic solution are injected every thirty or forty minutes.

SAMUEL J. FOGELSON, M.D.

Beck, A. C.: Detailed Technique of a Modified Local Anesthesia for Cesarean Section. *Am. J. Obst.*, 1942, 44: 558.

The author uses the following technique in the administration of local anesthesia for cesarean section:

All injections are made with a 10 cc. syringe to which lateral and plunger rings are attached to facilitate backward and forward movement of the plunger. The point of the needle is introduced into the skin slightly to the left of the midline and a small amount of ½ per cent procaine without adrenalin (Solution 1) is injected intradermally. The needle is then plunged through the skin and 1 cc. of the solution is forced into the subcutaneous tissues. These intradermal and subcutaneous injections are repeated until they extend somewhat beyond the extremities of the purposed line of incision. About 25 cc. of the solution are required.

The skin and subcutaneous tissues are incised down to the fascia over the rectus muscle. A 22 gauge, 3 in. needle is then introduced into the incised

tissues as near as possible to the fascia and passed outward to the outer border of the right rectus muscle. After a test to determine whether a vein has been entered, 2 cc. of 1 per cent procaine in 1–200,000 adrenalin (Solution 2) are forced into the region adjacent to the linea semilunaris. Similar injections are made at intervals of 1 cm. on each side of the wound. At the upper and lower angles, the needle is passed obliquely in order that the injections may extend beyond the limits of the incision.

Ten minutes are necessary for the blocking of the nerves, and the operator must wait the full ten minutes before continuing the operation.

If discomfort is felt when the peritoneum is grasped, it should be injected with ½ per cent procaine and 1–200,000 adrenalin (Solution 3) before the incision is made.

After incision of the peritoneum, traction is made on one side at the junction of its middle and lower third, and 5 cc. of Solution 3 are injected into the subperitoneal tissues on that side of the bladder. This is followed by a similar infiltration on the opposite side.

Smooth-pointed forceps now pick up the peritoneum on the anterior surface of the uterus about 1 in. above the bladder, and 10 cc. of ½ per cent procaine and 1–200,000 adrenalin (Solution 3) are injected beneath the bladder reflection. Pressure on the wheal thus made disperses the fluid toward the sides and under the bladder.

Before the uterus is incised, ⅓ gr. of pantopon and 1–200 scopolamine are given and the administration of nitrous oxide is started. During this time the uterus is incised with a knife and the incision is enlarged with scissors. The child is removed head first, manually, and the nitrous oxide is then discontinued. Nitrous oxide is given for a very short interval only (not much over one minute), which produces analgesia without anesthesia, since the patient usually hears the first cry of the child. If the nitrous oxide is given over too long a period, the patient may become restless and force the intestines into the field of operation. Immediately after the delivery of the child, 1 cc. of ergotrate is injected hypodermically and interrupted sutures are introduced through the muscle down to the endometrium. These sutures are placed 1½ cm. apart and are left long. After they have been introduced throughout the length of the wound, nitrous oxide is again administered for about one minute. The wound is then spread apart so that the hand may be introduced for the removal of the placenta. The placenta is separated and removed manually. Immediately after the removal of the placenta, the nitrous oxide is discontinued. Here again it is important that the administration of the gas be as brief as possible in order that the patient's condition may not get out of control.

The uterus is closed by making traction on and tying the previously introduced sutures. The abdominal wound is closed in layers.

EDWARD L. CORNELL, M.D.

NEWBORN

Henderson, J. L.: Erythroblastosis or Congenital Syphilis? Observations on Erythroblastosis and Its Differential Diagnosis from Congenital Syphilis. *J. Obst. Gyn. Brit. Empire*, 1942, 49: 499.

Erythroblastosis is a common fetal and neonatal disease which is still not generally recognized. A series of 53 infants with erythroblastosis is analyzed. Nineteen of the 53 infants recovered, 24 died, and 10 were stillborn. Autopsies were performed in all of the 34 fatal cases.

There is a high familial incidence of erythroblastosis. In this series 16 of the 46 mothers had 2, and 4 had 3, affected infants. First infants seldom suffer from the disease, but once it has appeared in a family any subsequent infants are more likely than not to be affected.

Anemia hemolytica neonatorum is the least severe form of the disease. Anemia is the predominant feature. Occasionally mild icterus, indistinguishable from the physiological type, occurs. The blood shows hyperchromia, erythroblastemia, and a variable degree of reticulocytosis, which depends on the reactivity of the erythropoietic tissues. Spontaneous recovery usually occurs but blood transfusion is sometimes necessary.

Icterus gravis is the most common type of erythroblastosis. Two-thirds of the cases in the present series fall into this group. Jaundice, which is the predominant feature, distinguishes this type from anemia hemolytica. It is either present at birth or it appears within twenty-four hours. The golden-yellow vernix found with congenital jaundice is often more noticeable than the jaundice itself. Spontaneous hemorrhage frequently occurs in the worst cases. It may occur any time within the first few weeks of life, thus distinguishing the condition from hemorrhagic disease of the newborn which is confined to the first few days. Degenerative changes in the basal nuclei of the brain are not uncommon and are revealed at autopsy by the bright yellow color of the affected nuclei—hence the term kernicterus. Death often occurs from toxemia within a few days of birth. Infants surviving this critical period usually recover provided hemorrhage is controlled by the administration of Vitamin K. Blood transfusion is usually necessary in the more severe cases and may have to be repeated.

Hydrops fetalis is a very grave form of erythroblastosis; it is incompatible with independent life because the severe degree of hydrothorax prevents pulmonary aeration. Advanced fetal edema can be diagnosed *in utero* by the roentgenological demonstration of a thickening and increased density of the soft parts. These features are most easily seen in the scalp. The severe fetal edema and greatly enlarged placenta are often responsible for a diagnosis of hydramnios. Apart from the outstanding manifestation of universal edema, the main features in this type of erythroblastosis are the same as in the less severe types of the disease except that there is little

or no jaundice, a worse degree of anemia, and a greatly enlarged, pale pink placenta.

Hepatic cirrhosis and intrauterine death are the principal features in the fourth and worst type of erythroblastosis. During the last few weeks of pregnancy hydramnios is common in this form of erythroblastosis, and intrauterine death of the fetus is followed within a week or two by the delivery of a severely macerated fetus and a greatly enlarged, pale pink placenta, as in hydrops fetalis. There is little or no edema. The liver shows only slight enlargement. The spleen is greatly enlarged.

The two most severe forms of erythroblastosis, hydrops fetalis and the type with hepatic cirrhosis in cases of intrauterine death, are usually mistaken for congenital syphilis on account of the large, pale colored placenta which occurs in both of these types of disease.

In syphilis there is a tendency for the disease to become progressively less severe. In erythroblastosis, the trend is in the opposite direction.

The frequency and degree of prematurity are much higher in syphilitic infants than in those affected with the hydropic and macerated types of erythroblastosis. However, the author's experience does not conform with that of some authors who have observed an increased incidence of abortion in families affected with erythroblastosis. This is much commoner in syphilitic families.

The placenta in hydrops fetalis and in erythroblastosis with hepatic cirrhosis and intrauterine death has a pale pink color; its thickness is greatly increased; and it may weigh several times as much as the normal placenta. In syphilis, also, the placenta has a pale pink color and an increased thickness and weight, but infarction, which is not a feature in erythroblastosis, is usually found in addition.

The histological features of the placenta in the two diseases bear a superficial resemblance for the villi show enlargement and diminished vascularity in both conditions. In cases of erythroblastosis with enlargement and pallor of that organ, a persistence of Langhans' layer of cells, which can be seen here and there, is the most characteristic histological feature. These cells normally disappear by the twenty-fourth week of pregnancy, and their persistence to term is not known to occur in any other disease. They can easily be distinguished from the overlaying syncytial cells by their larger and paler nuclei and cuboidal or columnar shape. Other abnormal features are the small size and inconspicuousness of the villous capillaries, a variable degree of edema in the stroma, and a great increase in the nucleated red cells in the vessels.

In the syphilitic placenta there is persistence of the abnormal epithelium and the villous capillaries are much more conspicuous than in erythroblastosis because of their thickened walls, the various degrees of endarteritis up to complete occlusion being a prominent feature.

Congenital syphilis and erythroblastosis resemble each other most closely in their hematological aspects. There is an erythropoietic response to toxic hemolysis in both conditions. The liver is heavily infiltrated with erythropoietic cells in both diseases, but in erythroblastosis the distribution is usually focal and there is a considerable proportion of more immature lightly staining erythroblasts, whereas in congenital syphilis the distribution is diffuse and most of the immature cells have reached the normoblast stage. Excessive erythropoiesis is also seen in the spleen in both diseases.

The diffuse intercellular cirrhosis of the liver which is found in congenital syphilis and in the severest type of erythroblastosis can often be distinguished by the occurrence of miliary gummata in the former disease. In the spleen a considerable degree of diffuse fibrosis is a constant feature in syphilis, whereas one only occasionally sees slight fibrosis in erythroblastosis.

Chondroepiphysitis is the most common lesion, but periostitis frequently occurs in syphilis, while osseous manifestations are absent in erythroblastosis.

The reactions in the specific serological tests for syphilis in the mother are of value in differentiating the two diseases in doubtful cases.

Finally, it is clear that the demonstration of the spirochaeta pallida in the tissues of the fetus, cord, or placenta would dispel any lingering doubt, but it must always be remembered that the organism is very much more difficult to demonstrate in fresh than in macerated tissues.

DANIEL G. MORTON, M.D.

MISCELLANEOUS

Perlman, H. H., and Dannenberg, A. M.: The Excretion of Nicotine in Breast Milk and Urine from Cigaret Smoking. Its Effect on Lactation and the Nursling. *J. Am. M. Ass.*, 1942, 120: 1003.

The rapid increase in the consumption of cigarets has resulted in many investigations to determine whether cigaret smoking is harmful. Particular study was made of cigaret smoking by pregnant and parturient women, to determine the effects of nicotine on the fetus and the newborn infant. The findings regarding the effect of cigaret smoking by parturient women on lactation and on their nurslings have been conflicting.

Since the quantity of nicotine in milk and urine is minute, the difficulties of detecting and accurately estimating it become apparent. A bio-assay method was used, with the small fresh-water crustacean, the daphnia. The well developed muscular and nervous systems of this animal make observation of them under normal conditions and under the influence of drugs easy. It was found that the daphnia was extremely sensitive to minute amounts of nicotine. Under the effects of known concentrations of nicotine, the reactions of the daphnia were studied so as to serve as standards for comparative purposes. Concentrations of 1:100,000 and above produced a period of paralysis, the time of onset being shorter as the concentration was greater. Concentrations of 1:1000 or above caused death. Between concentra-

tions of 1:100,000 and below, alternate periods of convulsions and paralysis were seen. With decreasing concentrations the reactions become less frequent and less severe, until at 1:2,000,000 periods of normalcy may occur. At concentrations of 1:10,000,000 the reactions are vague, ill defined, and only suggestive. The milk and urine was prepared by a definite method to decrease the turbidity, density, and toxicity of these solutions.

Fifty-five multiparas and primiparas were chosen. They all had an adequate supply of milk and were allowed to choose their own brand of cigarets. They were instructed to smoke completely each cigaret and when possible to inhale the smoke or at least blow it through their nostrils. After a sufficient quantity of milk was obtained for the infants, the residual milk in the breast was expressed and pooled over a twelve-hour period. It was separated into morning and afternoon specimens. The urine was also collected, pooled, and separated into morning and afternoon specimens.

Nicotine was found in every specimen of milk and urine obtained from mothers who smoked cigarets. It was never found in any specimen obtained from nonsmoking mothers.

Among the occasional smokers (1 to 4 cigarets), the average concentration of nicotine in milk obtained during the morning period was 0.116 mgm. per liter and during the afternoon period 0.16 mgm. per liter. The average concentrations in the morning specimens of urine was 1.857 mgm. per liter and during the afternoon 2.75 mgm. per liter. Among the moderate smokers (5 to 10 cigarets) the average concentration of nicotine in milk was 0.225 mgm. per liter in the morning period and 0.278 in the afternoon period. The average concentration in the morning specimens of urine was 2.828 mgm. per liter and during the afternoon periods 3.645 mgm. per liter. Among the heavy smokers (11 or more cigarets) the concentration of nicotine in the morning specimens of milk was 0.445 mgm. per liter and in the afternoon specimens 0.5 mgm. per liter. The concentration in the urine was 4.9 and 6.62 mgm. per liter during the morning and afternoon specimens, respectively.

Thus, there was a definite correlation between the quantity of nicotine excreted in the milk and urine and the number of cigarets smoked. Lactation was little, if at all, affected by the smoking of cigarets. Among the nurslings of these test mothers, regurgitation, vomiting, bowel movements, irritability, excessive crying, lassitude, pallor, and gains and losses in weight were apparently normal. A tolerance to nicotine may be a factor which prevents this toxic drug from affecting the infants and the lactating ability of the mothers. JOSEPH E. FIELDS, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Engel, F. L., Cohn, C., and Soffer, L. J.: A Further Report on the Treatment of Addison's Disease with Desoxycorticosterone Acetate by Intramuscular Injections, Subcutaneous Implantation of Pellets, and Sublingual Administration. *Ann. Int. M.*, 1942, 17: 585.

Case records are presented of 4 patients with Addison's disease who had previously been treated by the implantation of pellets, as well as of 4 additional patients. Serious intercurrent infections occurred in 2 patients, 1 terminating fatally. All 8 patients received treatment by intramuscular injection of desoxycorticosterone acetate in oil, and in 6 of them implantations of pellets of crystalline desoxycorticosterone were performed. In 2 cases 3 implantations, and in 1, 2 implantations were made.

The technique of preparing patients for pellet implantation and the importance of prolonged preliminary observation are emphasized. The use of desoxycorticosterone in propylene glycol sublingually in 4 patients demonstrated that this preparation is less effective than the hormone either in oil or in pellets. The nature of the toxic reactions from the acetate and the methods of avoiding them are discussed. That desoxycorticosterone acetate failed to influence the disturbances in carbohydrate metabolism was again confirmed. The importance of hypoglycemic reactions is emphasized.

WALTER H. NADLER, M.D.

White, R. R., and Wyatt, G. M.: Surgical Importance of the Aberrant Renal Vessel in Infants and Children. *Am. J. Surg.*, 1942, 58: 48.

The authors review 30 cases of hydronephrosis associated with aberrant renal vessels in children under twelve years of age who were operated upon at the Children's Hospital, Boston, Massachusetts.

The relation of the aberrant vessels to hydronephrosis is a controversial subject in the literature, but in each of these 30 cases aberrant renal vessels of such size and such proximity to the ureter were found that they were without doubt the cause of the hydronephrosis. In each case there was an associated marked or moderate dilatation of the renal pelvis. Ptosis, fibrous adhesions, and intrinsic ureteral obstruction, so frequently found with hydronephrosis in adults, are thought to represent secondary changes.

The age of onset of symptoms was equally distributed through the different years from birth to twelve years of age. Sex distribution was about equal. The right side was involved in 12 cases, the left side in 17 cases. Both sides were involved in 1 case.

The symptoms are apt to be of long duration, they may be intermittent, and they frequently suggest disturbances of the gastrointestinal tract. The most constant clinical picture was abdominal pain or vague gastrointestinal symptoms accompanied by one or more urinary signs, such as pyuria, hematuria, albuminuria, frequency, dysuria, enuresis, burning, or urgency. Fever is rare and laboratory findings are not of adequate significance. Physical examination may show no abnormalities. In only 8 cases was there a palpable mass in the kidney region.

Delay in diagnosis results from a tendency to regard these patients as victims of unexplained abdominal pain, recurrent or chronic pyelitis, or chronic pyelonephritis. The authors recommend that any patient who has repeated unexplained gastrointestinal complaints, especially if accompanied by one or more urinary signs, or any patient with pyuria who fails to respond to medical treatment within four or five weeks, should be examined by intravenous pyelography. When abnormal findings are detected by intravenous studies, or satisfactory pyelograms cannot be obtained by this method, cystoscopy and retrograde pyelography are advised. Details of the authors' technique are given.

Conservative therapy is urged whenever possible. Twenty-eight of the 30 patients were treated by ligation and division of the aberrant renal vessel. This is all that was necessary in 16 patients. In the remaining 12 patients additional procedures were indicated. Pyelotomy with exploration of the ureteropelvic junction was done in 7 patients, nephropexy was done in 1, plastic reconstruction of the pelvis in 1, reimplantation of the ureter into the kidney pelvis in 1, and heminephrectomy in 2. Primary nephrectomy was done in 2 cases.

The end-results following conservative surgery are evaluated and discussed. Satisfactory results were obtained in 85 per cent of 20 patients who were eligible for follow-up evaluation.

EDWARD W. GIBBS, M.D.

Hundley, J. M., Jr., Diehl, W. K., and Diggs, E. S.: Hormonal Influences upon the Ureter. *Am. J. Obst.*, 1942, 44: 858.

The authors have shown in previous communications that dilatation changes in the urinary tract are of frequent occurrence; also that typical histological alterations are noted, for the most part those of muscular hypertrophy, hyperemia, and increased vascularity. The most striking change observed was the great hypertrophy of the sheath of Waldeyer. There are two etiological factors that produce these alterations, i.e., hormonal influences and pressure effects. That hormonal influences play a role in the ureteral changes is sustained by the following facts: that definite hypertrophic changes occur in the ureter during pregnancy and also that similar alterations have been observed in the male ureter, the patient dying from a teratoma of the testicle with metastatic chorionepithelioma. With the advance

of pregnancy there is an apparent atony of the ureter observed, which induced the authors to study ureteral peristalsis during the various phases of gestation.

A summary of this study, made in 130 normal pregnant women, showed that during the early part of the first trimester the peristaltic behavior of the ureter was nearly similar to that occurring in the nonpregnant woman. However, as pregnancy progressed there was noted a continued and gradual decrease in the frequency as well as in the amplitude of the contraction waves, until in the seventh and eighth months a complete atonia existed. This atonic state continues up to a short time before delivery. There was then noted a return of the same peristaltic activity as seen during the latter part of the first trimester.

In the belief that these variations of ureteral behavior were engendered by hormonal stimulation, the authors made hydrophorographic tracings of normal women who had been subjected to intensive estrogenic and progestogenic therapy. Marked activation of ureteral peristalsis was noted in the group that received stilbestrol, while definite allaying of the contractions was produced by proluton and pranone.

From these observations it would seem that estrogenic substances activate the ureter and progestogenic substances allay this activity.

EDWARD M. CORNELL, M.D.

Colby, F. H.: Cutaneous Ureterostomy in Active Renal Tuberculosis. *J. Urol.*, Balt., 1942, 48: 357.

To relieve the intolerable discomfort of the bladder hopelessly diseased by tuberculosis, cutaneous ureterostomy was performed in 10 cases. Advanced disease was present in all patients, and in many there was active bone tuberculosis, as well as a genital lesion and probably other unsuspected disease, but there were no active pulmonary lesions. Unlike transplantation of the ureter to the large bowel, cutaneous ureterostomy entails little risk, and the author believes that it is the most effective method of relieving symptoms.

Simultaneous bilateral ureterostomy was done upon 2 patients who had bilateral renal tuberculosis. Both patients died within a few months and neither one, while alive, was particularly benefited as a result of the operation. Another patient died from a ruptured tuberculous ulcer of the small intestine before leaving the hospital. Considerable benefit from the operation resulted in those patients whose remaining kidney was diseased after the removal of the opposite tuberculous kidney. Intolerable bladder symptoms were relieved and the progress of renal damage was lessened. Five such patients in the present series are alive and useful.

If the operative result is a rosette of ureteral mucous membrane projecting beyond the skin there is reason to believe that patients can live comfortably without catheters and that they may escape stricture formation at the skin, even in the presence of active renal tuberculosis. These patients can easily care for themselves without the nuisance of changing catheters, and the danger of pyelonephritis, secondary infections with urea-splitting bacteria, and stone formation is lessened.

As usually performed, cutaneous ureterostomy holds no guarantee of a satisfactory junction of the skin and ureter. To accomplish this, the author offers a simple operative technique. The ureter is exposed through a rather high abdominal incision close to the midline, and carefully dissected from the peritoneum and retroperitoneal tissues to avoid damage to its blood supply. This is carried out from the bladder to the renal pelvis. The vesical end is clamped, cut, and carbolized, and brought out through the skin to form a gentle curve from the renal pelvis to the skin without angulation or tension. The wound is closed without drainage. With several centimeters of ureter protruding, the clamp is removed, a catheter is passed to the renal pelvis, the ureter is split on each side along the catheter, and the flaps are turned down to meet the edges of the skin incision. No sutures anchor the ureter to muscle or fascia, but the ureter and skin are sutured with silk for approximation. The catheter is anchored to the nearby skin. When the wound has healed, the catheter is removed and a colostomy bag is fitted to the patient. Whether such a procedure will be uniformly successful remains to be seen.

ARTHUR H. MILBERT, M.D.

Lord, J. W., Jr., and Eckel, J. H.: The Use of Vitallium Tubes in the Urinary Tract of the Dog. *J. Urol.*, Balt., 1942, 48: 412.

The pioneer work of Venable, Stuck, and Beach on the electrolytic effect of various metals in body fluids and bone led to their selection of an alloy, vitallium, as an ideal metal for use in the internal fixation of fractures. Venable and Stuck proved by careful biochemical studies that of all the metals and alloys tested only vitallium is completely inert and unaffected by body fluids.

The first and only report in the literature dealing with the use of vitallium tubes in soft tissue is that of Pearse who showed that a vitallium tube may be inserted into the common bile duct and the latter anastomosed over it with complete relief of a stricture and a permanent (sixteen months) flow of bile without complications. Pearse first performed the operation on the common bile duct of dogs and then subsequently used the vitallium tubes in human beings.

In March, 1941, the authors began their experiments on dogs by placing vitallium tubes into the ureter and renal pelvis of these animals. Two basic principles needed to be established: (1) that the ureter could be anastomosed end-to-end over a snugly fitting vitallium tube without leakage or other mishap, and (2) that no stone or encrustation would occur on the vitallium tube. After nine months of experimentation it is possible to state that once the technique of the anastomosis is mas-

tered, and this is extremely simple, the end-to-end anastomosis of the ureter over a vitallium tube is uniformly successful. Also, no stone, gravel, encrustation, or other pathological abnormality occurred on the vitallium tubes. They retained their original luster and patency in every animal.

JOHN A. LOEF, M.D.

BLADDER, URETHRA, AND PENIS

Davies, J. W.: Urinary Stress Incontinence; Its Relation to Cystocele and Lacerations of the Pelvic Floor. *J. Urol.*, Balt., 1942, 48: 536.

The author advocates the following surgical procedure for the treatment of urinary stress incontinence due to cystocele and laceration of the pelvic floor.

The entire thickness of the vagina is incised in the midline, from the cervix to the anterior perineal body. The incision is carried to the external urinary meatus. Clamps are then placed on the edges of the incised vagina, and the bladder and urethra are mobilized from it. At times very definite adhesions have to be divided by sharp dissection, but ordinarily they can be separated by blunt dissection. The bladder is then released from its attachment to the cervix of the uterus. This procedure exposes the so-called pillars of the bladder and their distal continuation as a gray, smooth, glistening tissue bounding a roughened, bleeding midline area which represents the tear in the capsule of the bladder. Occasionally the capsule and the muscularis of the urethra may be involved. Such a laceration permits the mucous membrane of the urethra to become intimately adherent to the vagina, and the separation of these two structures must be very carefully performed. If the mucous membrane of the lower two-thirds of the urethra is found to be directly in contact with the vaginal wall, it indicates that the voluntary muscular sphincters, lying between the urethra and the anterior vaginal wall, have been divided.

The author prefers to begin at the cervical portion of the bladder and reapproximate the retracted capsule with superficially placed mattress sutures. The first suture, in addition to reapproximating the retracted capsule, reanchors it slightly higher than normal on the anterior surface of the uterus. Subsequent sutures reapproximate the fibrous tissue covering the trigone and, as the neck of the bladder is reached, the retracted involuntary sphincter is accurately reconstructed without the use of a mushroom localizing catheter, which must be withdrawn at the expense of accurately placed sutures in a very delicate tissue. After the suture at the vesical neck has been placed, one frequently is led to believe that the urethra does not have an enveloping capsule because the insertion of the levator muscle into this structure draws the capsule lateral to the urethra. To find the retracted urethral capsule, one must deliberately overcome the tension of the tugging levator fibers. This is accomplished by placing an orienting suture in a recognizable structure, such as the reconstructed neck of the bladder, and extending the needle into the retracted tissue lateral to the urethra. Tying the suture will usually draw together the urethral capsule and suggest a plane in which the remaining capsule may lie. Subsequent sutures will elevate the sagging urethra to its normal position behind the pubic bone by restoring the tonicity of the levator fibers which insert into the urethral capsule. As the external urinary meatus is reached, the operator must accurately place a stitch to reapproximate the retracted fibers of the deep transverse perineal muscle, which acts as the sphincter of the membranous urethra. Before closing the anterior wall of the vagina, a suture tending to approximate the dimple at the distal end of the lateral sulcus of the vagina to the dimple of the corresponding side will splint the levator muscle supplying the urethra and relieve tension of the sutures recently placed therein. The dimple in the lateral sulcus of the vagina indicates an area into which the levator muscle is inserted.

The operation for urinary stress incontinence is not completed by the surgery on the anterior vaginal wall. A third urethral sphincter, which lies retracted in the lacerated pelvic floor, must be approximated. A perineorrhaphy must therefore be done to reattach the retracted ends of the bulbocavernous muscles in the central perineal body. It must be remembered that these muscles retract lateral to the vagina, and a suture must be placed lateral to the vagina in the substance of the labia minora. The retracted tissue can thus be identified. One can readily tell whether the retracted ends have been accurately reapproximated by appearance of the vulva at the completion of the stitch. If the opening of the vagina can be visualized without retraction of the labia minora, then the retracted ends of the bulbocavernous muscles have not been reattached.

JOHN A. LOEF, M.D.

Graham, W. H.: Ectopia Vesicae Complicated by Adenocarcinoma, with a Review of the Literature. *Brit. J. Surg.*, 1942, 30: 23.

The author discusses vesical ectopia from the standpoint of frequency, mortality, the relation to adenocarcinoma, and the etiological factors responsible for the development of this tumor in this condition. Two cases are added to the literature which brings the total of such cases reported to 28.

Neudorfer estimated the incidence of ectopia vesicae as 1 in every 50,000 births and W. E. Lower estimated that 2,000 persons with this condition are born in the United States yearly. Mayo and Hendricks estimated that 50 per cent of the individuals die in the first decade of life and 66.67 per cent before the twentieth year of life. Another estimate is that only some 10 per cent of these individuals reach maturity and a few of this number develop malignancy of the bladder. Grey Turner of England believes that the attitude of the medical profession toward these unfortunates it too gloomy and the mothers are discouraged and neglect these children.

The most rare among bladder tumors are simple adenomas, and adenocarcinomas constitute only 2 per cent of all bladder tumors. The opinions as to the origin of this type of tumor in the bladder are summarized as: (1) glandular structures supposedly normally present; (2) remnants of lining cells of the cloaca and of the sinus urogenitalis; (3) misplaced intestinal mucosal cells; (4) remnants of the urachus; and (5) cystic structures occurring in instances of chronic cystic cystitis. These various theories are discussed in detail and the author favors the view that the adenomatous tissue of the ectopic bladder is derived from a metaplasia of the normal transitional epithelium lining brought about by the irritation to which it is exposed, i.e., mechanical friction of clothing and air.

Two cases of adenocarcinoma of the bladder are described in detail and it is emphasized that such a malignancy is rare. Both cases were treated with excision of the bladder with bowel implantation of the ureters in one, and in the other the ureters were allowed to drain through a natural fistula onto the abdomen since the ureters were too dilated to affect a successful bowel transplantation.

ROBERT LICH, JR., M.D.

Barringer, B. S.: The Control of Bladder Cancers. *J. Am. M. Ass.*, 1942, 120: 909.

Bladder carcinomas are well adapted for treatment by radon implants. One-fourth of them are accessible for cystoscopic examination and implantation. Others, because of their size, position, or bleeding, are better exposed by the suprapubic approach. Papillary carcinomas tend to remain confined to the bladder and are slow to metastasize. Infiltrating carcinomas invade the bladder wall and metastasize early.

The author reports 257 personal cases of bladder cancer. One hundred and twelve were of the papillary type. Three of these were subjected to palliative operation. Of the remaining 109 cases, 20 were cured but the patients died of some intercurrent disease or were not followed up for the entire five-year period. Of the remaining 89 patients, 50, or 56.1 per cent, were well for five years following treatment with radon implants.

One hundred and forty-five cases of tumor of the infiltrating type were seen. Twenty-four of these were excluded from the report because the patients had received palliative operation or no operation, had died of some intercurrent disease, or were not followed up for the entire five-year period. Of the remaining 121 patients with infiltrating carcinomas, 35, or 28.9 per cent, were well for five years following treatment with radon implants.

Of 210 patients with either papillary or infiltrating carcinoma of the bladder, 85, or 40.4 per cent, were well for five years.

Suprapubic implantation was done 183 times and cystoscopic implantation was done 89 times. The most important complications of radon implantation are infection and stone formation on the dead tumor base. These are diminished by the use of sulfathiazole crystals in the bladder and in the suprapubic wound following implantation, by using weaker radon seeds, and by planting them farther apart and not so deep as formerly when the tumor base is badly indurated. Ureteral catheterization at the time of cystotomy in the presence of both hydroureter and hydronephrosis has reduced the incidence of infection of hydronephrotic kidneys.

Tumors of the bladder vault and extensive papillomatosis are better treated by surgery alone, but in all other forms of bladder cancer radon implantation is simpler, safer, and gives greater assurance of five-year cure.

EDWARD W. GIBBS, M.D.

GENITAL ORGANS

Miller, M. L., and Moore, R. A.: Variation in the Daily Excretion of Androgens in Relation to Benign Hypertrophy of the Prostate. *J. Urol.*, Balt., 1942, 48: 544.

One of the most difficult and intriguing problems of endocrinology is the explanation of the mechanism of the formation of nodules in the endocrine glands, and in tissues under endocrine control. The more important lesions in this category are the adenomas of focal hyperplasias of the pituitary, thyroid, parathyroid, and adrenal glands, fibroadenoma of the breast, and leiomyoma of the uterus.

The daily variation in urinary excretion of androgen was measured for a period of thirty days in 4 men, 2 with benign hypertrophy of the prostate and 2 of comparable age without prostatic hypertrophy.

The daily fluctuations in the urinary excretion of androgen by the men with benign hypertrophy of the prostate were found to be no greater than the similar fluctuations in urinary androgens by men free of prostatic disease. JOHN A. LOEF, M.D.

Brunet, W. M., Shaw, N. D., Reinhardt, C. H., and Anday, I. J.: Chronic Prostatitis. A Clinical Review of 100 Cases in Which the Fresh and Peroxidase-Stained Secretions Were Studied. *Virginia M. Month.*, 1942, 69: 619.

The authors discuss prostatitis from both an etiological and symptomatic standpoint and analyse 100 cases. The value of peroxidase-stained prostatic secretions is emphasized and this technique is recommended for determining the amount of active infection in the gland.

The mode of infection of the prostate is variable; it may be due to: (1) gonorrhea, (2) bacteria harbored in the kidneys or bladder, (3) urinary retention, (4) the introduction of foreign bodies or calculi of the prostate, (5) bacterial metastasis from some focus of acute infection such as the tonsils, teeth, influenza, or upper respiratory passages.

The authors classify the 100 cases into 3 symptomatic groups: Group I, in which urinary symptoms predominate; Group II, in which the prostate exists as the focus of infection for other parts of the body;

and Group III, in which individuals exhibit sexual dysfunction. The number of patients in the aforenamed groups were 54, 22, and 24, respectively, and the authors further discuss the relationship between these groups and venereal history, age, marital status, previous prostatic or urinary-tract disease, and treatment.

The use of the peroxidase stain for prostatic secretion is emphasized since because of the inherent nature of the stain the granular cells appear blue-black and thus create a marked contrast in reference to other cells. It was noted in this series that the use of this stain revealed consistently more polymorphonuclear cells per field of prostatic fluid. The lymphocytes are easily differentiated since these cells are stained deep red.

From the standpoint of treatment it was noted that patients in Group I fared best with urethral irrigations or instillations. Those in Group II, or the group with silent prostatic infection were treated conservatively with prostatic massage, which was carefully undertaken so as not to induce a general systemic reaction which would only add to the period of disability. The fact that manipulation of the prostate caused an occasional exacerbation of symptoms seemed definite evidence to the authors that the prostate was the source of the patient's trouble. The patients in Group III, those complaining of sexual dysfunction, presented only an occasional organic disturbance and thus fell into the group for psychotherapy, and the authors admit that the results were not brilliant.

The authors point out that chronic prostatitis is a condition not frequently found in the negro because social barriers do not prevent him from leading a life of normal sexual hygiene. However, in the case of white patients social requirements prevent the resumption or execution of sexual desires and thus the altered physiology of the prostate gland receives little aid in re-establishment of normal function. Hence, it is pointed out that prostatic massage offers only alleviation of symptoms until normal sexual relations can be resumed, and it is the latter that aids most in the establishment of a cure.

Progress in the alleviation of prostatitis by massage is demonstrated by the reduction of pus in the expressed secretion of the gland and the reappearance of the lecithin bodies. When the stage in which the lecithin bodies outnumber the pus cells is reached further improvement is dependent upon the resumption of normal sexual relations. Furthermore, prostatic massage should not be administered more often than twice weekly, and after the lecithin bodies outnumber the leucocytes in the prostatic fluid the massage interval should be increased.

In cases in which massage or even light stroking of the prostate initiates a generalized reaction the therapy should be discontinued in favor of foreign proteid injections and hot baths until the symptoms subside. If massage institutes an acute epididymitis resumption of prostatic manipulation must not be instituted for a period of at least four weeks following the disappearance of pus from the second urine specimen. It was noted that generally large irregular firm prostates yield to treatment slowly, and this was considered due to inadequate drainage because of periprostatitis. On the other hand, soft boggy organs respond rather promptly to massage although leucocytes in the expressed material are usually high.

Subjectively, the authors found in this group of 100 cases that 60 individuals were completely relieved and their prostatic secretion contained less than 10 per cent white blood cells per microscopic field. In 24 cases the condition as revealed by the objective and subjective symptoms was greatly "improved," but the expressed prostatic fluid maintained a cell count of more than 10 white blood cells per high power field. In the 16 cases showing no improvement all the individuals complained of sexual dysfunction and in none was any organic genitourinary disturbance found by any method employed. ROBERT LICH, JR., M.D.

Belt, E.: Radical Perineal Prostatectomy in Early Carcinoma of the Prostate. *J. Urol.*, Balt., 1942, 48: 287.

The author discusses the operative results in 50 cases of prostatic carcinoma seen in private practice during the past twenty years, and describes an advocated operative procedure. In this series of 50 cases there were 2 operative deaths; 10 patients died over a period of ten years of causes other than cancer; 19 died of metastasis and local recurrence, and 19 are still living without evidence of cancer. Hence, the author concludes that in 58 per cent of the cases death from cancer was prevented.

Up until the present time it has been difficult to determine whether or not surgery is indicated in prostatic malignancy; however, the author states that it is his belief at the present time that so long as the "acid phosphatase" is below 4 King-Armstrong units, surgery can be considered. However, it is stressed that the diagnosis of operative prostatic cancer still rests with the general practitioner. The urologist, on the other hand, has the responsibility of offering an operative procedure embodying the following attributes: (1) speed and certainty; (2) freedom from shock; (3) a minimum of operative bleeding; (4) a short postoperative bed period; and (5) adequate vesical control following surgery.

The author describes his method of radical perineal prostatectomy. The article is accompanied by illustrations demonstrating each operative step. Essentially, the procedure is that of bloodless approach to the prostate by remaining within the confines of the external rectal sphincter and carefully following along the longitudinal muscle fibers of the rectum to the prostate. Laterally the prostatic vessels are then doubly ligated and cut. The thin veil of fascia covering the seminal vesicles is transversely cut, and the vesicles and a portion of the vas are removed following ligation of their blood supply. The apex of the prostate is then approached and the gland is cut across so that a collar of prostatic tissue remains at-

tached to the membranous urethra, a procedure of extreme importance for protection of the external urinary sphincter. The prostate is dissected free and the gland cut free of the bladder. The vesical neck and urethra are approximated over a urethral catheter with a series of sutures specifically placed, and the fascial sheath which covered the vesicles is sewn over this suture line. The wound is then closed by approximating the levator ani and attaching the rectal sphincter to the median raphe with a circular stitch. A rubber tube is passed to the posterior aspect of the bladder, and the skin is then closed with a subcuticular stitch. The rubber dam is removed in twenty-four hours and the catheter is removed in seven days. The wound usually heals *per primam* and the operation fulfills all the previously mentioned criteria. ROBERT LICH, JR., M.D.

Dockerty, M. B., and Priestley, J. T.: Lymphosarcoma of the Testis. Report of 4 New Cases. *J. Urol.*, Balt., 1942, 48: 514.

Tumors of the testis are relatively infrequent, occurring but once in approximately every 1,500 male patients admitted to the Mayo Clinic. About 95 per cent of these tumors are malignant, the incidence being unequally divided between malignant teratomas (including monodermal adenocarcinoma) and seminomas. The type in both is carcinoma. For some strange reason sarcoma of the testis is rarely observed, either as primary neoplasia of the connective-tissue elements normally present or as one-sided development in the mesodermal component of a testicular teratoma.

When the problem of metastatic involvement is considered it is seen that the testis is almost immune. Although most investigators concede that the testis can become invaded in the generalized spread of a malignant process, all are in agreement that such localization is extremely unusual. With lymphosarcoma of the testis the problem becomes doubly complex. In the first instance it must be established with certainty that the neoplasm is a lymphosarcoma (Chevassu has clearly shown that many of the older cases, so recorded, were in fact examples of embryonal carcinoma). Furthermore, evidence must be adduced to indicate whether the testicular lesion is primary or merely a localized manifestation of a generalized lymphosarcoma. Both of these phases of the problem have been carefully considered in presenting 4 cases of lymphosarcoma involving the testicle.

Analysis of the authors' material would tend to support the "metastatic" concept. In 2 cases involvement of the testis occurred late in the course of the disease. In one of these cases and in another case enlargement of the inguinal lymph nodes preceded by many months the appearance of retroperitoneal lymphadenopathy—a sequence almost inconceivable if the testis were the primary focus. Finally, the microscopic picture of infiltration rather than destruction in the testis favors an embolic (metastatic) origin of the malignant cells.

MISCELLANEOUS

Tomskey, G. C., Vickery, G. W., and Getzoff, P. L.: The Successful Treatment of Granuloma Inguinale, with Special Reference to the Use of Podophyllin. *J. Urol.*, Balt., 1942, 48: 401.

In a study of 102 unselected cases of proved granuloma inguinale, the authors studied the standardized methods of treatment. They submit a new mode of therapy which has been successful in all cases treated by them. In 82 instances the usual methods of treatment included tartar emetic alone, tartar emetic and surgical excision of the lesion, tartar emetic and antiluetic therapy, tartar emetic and one of the sulfonamides, and surgical excision alone. In 20 cases, a local application of 20 per cent podophyllin in olive oil and scarlet red ointment was given. Although these patients also received tartar emetic, several others treated as outpatients were cured by the application of podophyllin alone.

Podophyllin is the dried rhizome and roots of *podophyllum peltatum*, an herbaceous perennial growing in the rich woodlands of Canada and the United States. The mode of action of the drug awaits further study, although the present conception is that it acts as a dehydrating agent on the infected granulating tissues and also exerts a cauterizing effect. The preparation used is a mixture of 20 per cent podophyllin in olive oil.

The authors outline the following treatment:

1. Eliminate secondary infection by cleansing with hydrogen peroxide and giving hot sitz baths, twice daily.

2. Apply 20 per cent podophyllin in olive oil to the lesion after each bath. If this application produces pain, a topical analgesic (pontocaine, metycaine, nupercaine) is applied ten minutes before the treatment.

3. To stimulate epithelialization after the exuberant granulations have disappeared and a healthy base is evident, scarlet red ointment is applied following each bath. Occasionally it is found necessary to continue the application of podophyllin to small resistant areas, usually at the edge of the lesion. This is imperative if a complete cure is to be obtained.

Podophyllin may be prescribed for patients, instructions given for its application, and periodic check-ups made in the clinic; this will eliminate the cost, loss of working time, and inconvenience, all of which, of necessity, are associated with prolonged hospitalization. The drug is safe and economical, and its therapeutic value is emphasized by the fact that permanent cures have been attained—a result which previously had never been obtained by the authors.

ARTHUR H. MILBERT, M.D.

Sullivan, T. J., Gutman, E. B., and Gutman, A. B.: Theory and Application of the Serum "Acid" Phosphatase Determination in Metastasizing Prostatic Carcinoma; Early Effects of Castration. *J. Urol.*, Balt., 1942, 48: 426.

The theoretical and experimental developments leading to the use of the serum "acid" phosphatase

determination in patients with metastasizing prostatic carcinoma are reviewed.

The reliability of the determination as a practical method for the diagnosis of metastasizing prostatic carcinoma is considered on the basis of the authors' results over a four and one-half years of clinical trial. The method failed, i.e., values of less than 3 units per 100 cc. were obtained in approximately 15 per cent of 130 patients with prostatic carcinoma and definite or suggestive roentgenographic evidence of metastases; the remaining 85 per cent showed increases in serum "acid" phosphatase which in extreme cases exceeded 1,000 units per 100 cc. Approximately 89 per cent of 70 cases of prostatic carcinoma without roentgenographic evidence of skeletal metastases gave values of less than 3 units per 100 cc., as did all of 85 cases of diseases of the prostate gland other than carcinoma. Of a control group of 570 patients with nonprostatic disease, 90 per cent had serum "acid" phosphatase levels of less than 3 units per 100 cc.; 7.5 per cent gave values between 3 and 4.9 units per 100 cc., and 2.5 per cent gave values of more than 5 units per 100 cc., the maximum being 9.0 units per 100 cc. The conclusion drawn from this experience is that the method is consistent and specific enough to be a valuable though not infallible supplement to clinical, roentgenographic, and other procedures for the diagnosis of metastasizing prostatic carcinoma.

The applications of the determination which have proved useful in diagnosis and treatment are discussed. They include (1) corroborating the diagnosis of metastasizing prostatic carcinoma when suggested by other methods; (2) providing evidence of metastases from prostatic carcinoma before they are definitely demonstrable by x-ray visualization or other methods; (3) determining the prostatic or nonprostatic origin of tumors in patients known to have metastases; (4) differentiating Paget's disease from metastatic prostatic carcinoma; (5) aiding in the selection of cases for prostatectomy and in the detection of recurrence in prostatectomized patients; and (6) aiding in the selection of cases for androgen control, and in the evaluation and regulation of such treatment. Case reports from the authors' records are cited to illustrate these applications.

The important work of Huggins and his associates concerning the effects of castration is confirmed and amplified. Castration in 31 patients with metastasizing prostatic carcinoma and serum "acid" phosphatase levels ranging from 520 to 4.2 units per 100 cc. resulted in an early precipitous fall in serum "acid" phosphatase which was often temporarily arrested at about the third week by a slight, transient secondary rise and then followed by a pro longed decline until an equilibrium was reached in two or three months. The effect of castration on the serum "alkaline" phosphatase was more variable. After a latent period with no significant change, erratic fluctuation, or downward trend, a marked increase in serum "alkaline" phosphatase usually occurred, most often about the second or third week, which was followed by a gradual decline until equilibrium was reached after many months.

In general agreement with Huggins and his associates, most of the patients, during the short period of observation, showed remarkable clinical improvement following castration. JOHN A. LOEF, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Travell, J., Rinzler, S., and Herman, M.: Pain and Disability of the Shoulder and Arm. *J. Am. M. Ass.*, 1942, 120: 417.

The painful shoulder syndrome is known for its chronicity and frequent recurrence. The variety of therapeutic procedures employed suggest either that the customary methods of treatment are unsatisfactory or that the underlying cause is not understood. Kellgren, Eideken, Steindler, and others have satisfactorily demonstrated that tender areas in muscle not only cause pain locally but also pain referred to other somatic structures. An instance of this is pain in the lower back with pain referred to the leg. The injection of procaine into the "trigger points" not only relieved the local pain but also the pain in the leg.

Fifty-eight patients, some ambulatory and some with hypertensive, pulmonary, and cardiovascular disease, in the age group ranging from twenty-nine to seventy-eight years were selected to form the basis of this report. The pain was present from a few weeks to one year. Intense pain was present in front and in back of the deltoid region and occasionally in the scapular region, and often it radiated to the forearm and hand and caused paraesthesias in some of the cases. Limitation of motion was present in three-fourths of the cases, and active and passive motion always increased the discomfort. All cases presented had one or more trigger points in various muscles of the shoulder girdle and back. Any muscle innervated by the spinal segment C5 to Th1 may cause pain referred to the upper extremity. The trigger points are more resistant to palpation than the surrounding muscle; they are extremely tender and usually not identical with the site of spontaneous pain. Either active or passive contraction of the muscle in which the trigger point is located causes pain. The muscle which most often causes pain in the shoulder is the serratus posterior superior (Fig. 1). By flexion of the spine and lateral rotation of the scapula the muscle is exposed to palpation and injection. The referred pain is most intense over the triceps, the pectoral region, the ulnar border of the forearm, and the fourth and fifth fingers (Fig. 2a). The infraspinatus muscle is second in causing pain to the shoulder. The radiation of pain was most commonly noticed over the "shoulder tip," and in the biceps and brachioradialis muscles (Fig. 2b). Several conditions are mentioned from which the "painful shoulder syndrome" should be differentiated.

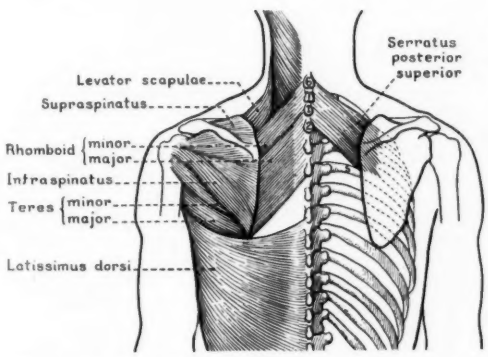

Fig. 1. The left side shows the shoulder-girdle muscles with trapezius and deltoid muscles removed. The right side shows the overlapping of the serratus posterior superior muscle by the scapula in ordinary posture.

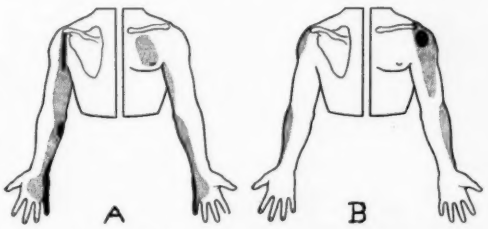

Fig. 2. A, radiation of pain from the serratus posterior superior muscle. B, radiation of pain from the infraspinatus muscle.

The roentgenogram is of great assistance in making the diagnosis of fractures, dislocations, the presence of cervical ribs, and arthritis.

Subacromial bursitis is recognized by signs of local inflammation and swelling. The presence of calcific deposits in the region of the subacromial bursa, which may have existed for a number of years without causing any symptoms, doesn't sufficiently justify the diagnosis of pain due to chronic bursitis.

The scalenus-anticus syndrome, characterized by pain in the neck and shoulder with signs of venous obstruction and vasomotor changes is not due only to neurocirculatory compression but also to trigger points located in the scalenus muscle. The diagnosis of pain referred to the arm and shoulder is made by the absence of signs of compression and a pain pattern which follows the segmental distribution of C5 to C7 (biceps, radial aspect of forearm, and proximal interphalangeal joints with inability to close the fingers), which corresponds with the innervation of the scalenus-anticus muscle. In compression of the brachial plexus there is, in most instances, impingement of the lower fibers rather than compression of the upper fibers and the pain follows chiefly the ulnar distribution C8 to Th1.

Brachial neuritis, radiculitis, and spinal-cord involvement may usually be discovered by a complete neurological examination.

Pain in the arm and shoulder due to coronary thrombosis and angina pectoris can readily be recognized. Patients have no difficulty in differentiating between pain of somatic and cardiac origin.

The symptoms of vascular disorders such as embolism and thrombosis rarely present a diagnostic problem.

One per cent aqueous solution of procaine hydrochloride was used for infiltration of localized tender areas. Cooperation of the patient is essential in the localization of the trigger points. From 2 to 5 cc. of 1 per cent procaine solution were slowly injected. If the primary focus was injected the pain subsided within a few minutes which sometimes was preceded by increased pain both locally and in the referred areas. As many points as possible were injected. From 10 to 20 cc. of 1 per cent procaine solution were injected at any one visit. Every patient received first a test dose of 1 or 2 cc. of the procaine solution. Transient toxic signs such as dizziness, talkativeness, partial deafness, sensation of constriction of the throat, and thirst lasted only from ten to twenty minutes. The optimum interval for repeated injections was from four to ten days. Usually improvement was immediate and dramatic. If no improvement was apparent after three treatments no further injection therapy was suggested. The sooner treatment is instituted after the appearance of pain the better the chances for success.

The following criteria must be followed if successful treatment is expected: (1) localization of and persistent injection of all new trigger points, (2) recognition of referred pain patterns, (3) avoidance of infiltration of referred areas, and (4) correct diagnosis of "idiopathic myalgia."

The mechanism of the procaine action is unknown. Pain in muscles is usually designated as fibrositis, myositis, and myofibrositis, although the temperature, blood count, and blood sedimentation rate are usually normal and muscle biopsies of painful and indurated muscle areas show no signs of inflammation. One theory implies that because of the increased range of motion after the abolition of pain, adhesions are broken up and exudates are absorbed. Leriche advances the theory that the stimulated sympathetic nervous system causes vasoconstriction in the muscle which results in ischemic pain. A third hypothesis attributes the pain to skeletal muscle spasm which likewise results in ischemic pain. Muscle spasm causes pain and pain reflexly causes muscle spasm. This self-perpetuating cycle is broken up by the intramuscular injection of procaine in blocking the afferent nerve impulses or by its curarelike action on the motor end plates. Another therapeutic measure sometimes effective in myalgias is the "Liebman's maneuver" consisting of strong pressure applied to the trigger zones which are the sources of referred pain. It has been shown that 25 lbs. of pressure per square inch will block motor nerve fibers. Ethyl chloride applied to the skin over tender areas sometimes relieves pain. It is known that local anesthesia of the skin produces relaxation of the underlying muscle. All these procedures which relieve pain in the upper extremity have in common the effect of relaxing muscle.

GEORGE I. REISS, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Thompson, T. C.: A Modified Operation for Opponens Paralysis. *J. Bone Surg.*, 1942, 24: 632.

The author presents a modification of the Royle operation for opponens paralysis based on experimental procedures developed on cadavers, and the clinical results of 15 operations. The latter included the Steindler, Bunnell, and regular Royle operations as well as 10 modified Royle procedures, the best results being obtained by the modified Royle operation. The new procedures consist of the following steps:

1. An incision is made in the palm to expose the sublimis tendon of the fourth finger. The tendon is severed distally through an incision at the base of the fourth finger. The tendon is drawn out through the palmar incision and brought subcutaneously across the thenar eminence into an incision on the dorsal aspect of the thumb. The incisions at the base of the fourth finger and palm of the hand are closed.

2. A hole is drilled through the first metacarpal bone near its distal end, and one-half the tendon is drawn through. If sufficient apposition is not obtained by this tendon because of a fixed deformity at the metacarpophalangeal joint, a transverse osteotomy is performed through the base of the metacarpal.

3. The other half of the transplanted tendon is brought over the extensor muscles of the thumb and drawn through a small fascioperiosteal tunnel at the base of the proximal phalanx. The two ends of the tendon are sutured to each other and the skin incision is closed. The thumb is held with a spiral adhesive strapping for from four to six weeks.

An excellent set of illustrations accompanies the article and the detailed mechanics of obtaining the greatest amount of opposition by the various tendon transplants are explained. The authors obtain the greatest levering force by using the transplant described.

DANIEL H. LEVINTHAL, M.D.

Abbott, L. C., Saunders, J. B. deC. M., and Bost, F. C.: Arthrodesis of the Wrist with the Use of Grafts of Cancellous Bone. *J. Bone Surg.*, 1942, 24: 883.

Arthrodesis of the wrist may be performed with pleasing results in postpoliomyelitic paralysis of the hand and forearm, paralysis of spastic type, and in Erb's palsy. The operation is also of value when damage has occurred either to the brachial plexus or

to the peripheral nerves, and for painful wrists of either traumatic or infectious origin. Cancellous bone has been used by the writers as a grafting material for more than twenty years. This operation attempts to arthrodese the wrist and preserve the mechanism of the radioulnar and carpometacarpal joints and maintains as far as possible the unity of action of the extremity as a whole.

The operation for arthrodesis of the wrist requires two incisions: one over the crest of the ilium for removal of the iliac bone, and one for exposure of the wrist joint. Grafts are removed from the ilium with an osteotome held parallel to the crest. In the wrist, the incision is made over the posterior aspect of the wrist with its center over the dorsal tubercle. The dorsal carpal ligament is exposed and is incised vertically. The posterior aspect of the lower end of the radius is exposed subperiosteally. The wrist is held in palmar flexion while the cartilage is removed from the lower end of the radius and the upper surfaces of the navicular and lunate (semilunar bone). The curved flap is now turned; it consists of the fibrous capsule of the joint together with a thin section of cortex from the posterior surfaces of the navicular, lunate, and capitate bones. Curved grafts are placed in the radiocarpal joint and chip grafts are fitted into the intercarpal and transverse intercarpal joints, then long grafts are used to cover the lower end of the radius and the denuded carpal bones. The ends of the grafts are tucked beneath the bases of the radial and carpal bone flaps. The margins of the flaps are then approximated with mattress sutures lying deep in the transverse planes. Vertical mattress sutures close the dorsal carpal ligament. A plaster-of-Paris cast is applied; it extends from the upper arm to the tips of the fingers and thumb, and the elbow is held at right angles with the forearm in mid-prone position. The wrist is fixed in from 10 to 15 degrees of dorsal flexion.

Eight cases are described in detail, traumatic, arthritic, and tuberculosis cases as well as different types of paralysis being considered.

RICHARD J. BENNETT, JR., M.D.

Phalen, G. S., and Chatterton, C. C.: Equalizing the Lower Extremities. A Clinical Consideration of Leg Lengthening Versus Leg Shortening. *Surgery*, 1942, 12: 768.

The author states that lower extremities which are unequal in length often produce a deleterious effect on the patient from both a mechanical and a psychological standpoint. Mechanically, no more than 4 cm. of shortening of one leg may be compensated for by a tilting of the pelvis. When the shortening is more than this amount, a lift must be inserted into the shoe of the short leg to prevent the development of an excessive curvature of the spinal column. Scoliosis and poor posture, with resultant symptoms of strain and fatigue, commonly result from an uncorrected inequality in length of the legs. Psychologically, a shortened lower extremity because of its attendant disadvantages may be harmful.

Anterior poliomyelitis is one of the etiological agents which most frequently produce shortening of a lower extremity. Other causes of shortening include malunited fractures, epiphyseal arrest caused by either injury or infection, congenital dislocation of the hip, arthritis of the hip or knee, congenital anomalies, tumors, and chronic infections of bone. It is with these conditions that the orthopedist has chiefly to deal in cases of inequality in length of the lower extremities.

The authors limited their paper to consideration of leg shortening and leg lengthening. They said that from 1933 to 1940, inclusive, operations for bone shortening were performed in 19 cases at the Gillette State Hospital for Crippled Children. There were 12 operations on the femur and 7 on the tibia and fibula. Shortening obtained by operation ranged from 4 to 8.5 cm., the average for all the cases being a little more than 5 cm.

The average number of days in the hospital for each of the first 18 patients in this series was 168; the greatest number, 292; and the least 101. The majority of the patients began walking with guarded weightbearing, three months after operation.

The authors said there are definite disadvantages to the operation of bone shortening. It is most important for the surgeon to realize that this operation is performed on a normal extremity in the presence of an extremity that is already abnormal. This jeopardizing of the well leg makes any postoperative complication all the more serious and costly. A patient who has only one normally functioning leg will think twice before consenting to any elective operative procedure on the well member. A lift on the shoe of the short leg, no matter how unsightly, would certainly be preferable to a postoperative disability of the previously normal longer leg.

The authors believe that a leg-shortening operation should not be performed until after the growth of the patient has been well attained. In the series of 19 cases they reported the average age of the patients was eighteen and a half years; the youngest patient was sixteen, and the oldest twenty-one years of age.

The surgical procedure for bone lengthening is much newer than that for bone shortening. The average number of days in the hospital for each of the patients in this series was 244.5; the greatest number was 552, and the least number, 87. The patient who stayed in the hospital 552 days had a lengthening of both the tibia and femur. The majority of the patients began walking with guarded weightbearing, about four months after operation.

In most of the cases a tongue and groove osteotomy of the tibia was performed. The steps of this operation are as follows: tenotomy of the Achilles tendon; transverse osteotomy of the fibula; insertion of one Steinman pin in the lower end and two pins in the upper end of the tibia; tongue and groove osteotomy of the tibia between the pins; cutting of all tight fascial and periosteal bands; and application of the leg-lengthening apparatus. The osteotomy of the

tibia is performed through a long, curved, anteromedian incision; the tibial shaft is exposed; and, with the double-blade motor saw, a long double cut is made through the anterior osseous cortex. These two vertical saw cuts are joined below by a transverse cut anteriorly and above, by means of Gigli's wire saw, posteriorly. This leaves the tongue graft above and the groove below.

Before an operation for leg lengthening is performed, the patient should try wearing an elevated shoe, not only to correct secondary conditions such as scoliosis and poor posture, but also to determine the amount of lengthening which will give the optimal improvement in function. Whether or not there is a fixed pelvic obliquity should also be determined before operation. If the abductor muscles of the hip are weak, as they frequently are in cases of poliomyelitis, equalization of the lower legs and consequent leveling of the pelvis will so change the leverage of these weakened muscles that the gait may be worse after the lengthening than before the operation. At least one case has been reported in which the hip gradually dislocated after a lengthening operation upon the tibia. A child who has very weak hip muscles walks better if the paralyzed leg is at least a half inch shorter than the normal leg. The authors believe it is not advisable to perform a leg-lengthening operation of any type unless the quadriceps and abductor muscles of the hip are found to be strong.

An operation for leg lengthening is not indicated unless there is shortening of more than 2.5 cm. that is producing impairment of gait. Clinical or roentgenographic evidence of previous infection, or other pathological involvement of the bones of the short extremity contraindicates the operation for bone lengthening. Another contraindication is a shortening of so marked a degree that the maximal lengthening even of both the tibia and femur will not sufficiently equalize the extremities. In these rare cases, amputation and the use of an artificial limb will give better functional results.

The authors believe it is preferable for the patient to be at least fourteen or sixteen years of age before he undergoes the operation, although in this series of 26 cases, 8 patients were less than fourteen years old. The youngest patient was nine and the oldest twenty-one years old; the average age for the 26 patients was fifteen and a half years.

Leg lengthening is a somewhat formidable and technically difficult operative procedure entailing a prolonged period of disability and risk of numerous complications, of which the more important are postoperative infection, delayed union or nonunion, paralysis of nerves caused by stretching, circulatory disturbances (prolonged edema, chronic ulcers, thrombosis), breaking of the metal traction pins, and fracture of the tongue graft.

The authors believe, however, that for the majority of patients who have shortening of one of the lower extremities an operation for leg shortening is preferable to an operation for leg lengthening.

The operation for leg lengthening has certain decided advantages over the procedure for leg shortening. The operation for leg lengthening is performed on the abnormal extremity, and the well leg is not jeopardized. Furthermore, height is not sacrificed by an operation for leg lengthening; a loss in height may be a marked physical or mental handicap to a patient of less than average stature.

The operation for leg shortening, however, is relatively simple and safe, and the procedure is accurate. The shorter period of disability after this operation means a great saving of time and money for the patient. The short leg nearly always is found to be ill adapted to plastic operations; especially as a result of poliomyelitis, the short leg has weak, atrophic muscles, slender bones, and a relatively poor blood supply. The sound limb is much better suited than the weakened limb to withstand a major surgical procedure. In most cases of inequality of the lower extremities, the operation for leg shortening offers a mechanical advantage in that lowering of the center of gravity of the body tends to increase bodily stability and improve locomotion.

FRACTURES AND DISLOCATIONS

Bost, F. C., and Inman, V. T.: The Pathological Changes in Recurrent Dislocation of the Shoulder. A Report of Bankart's Operative Procedure. *J. Bone Surg.*, 1942, 24: 595.

Bankart observed 27 cases in which at operation the labrum glenoidale was found to be detached from the glenoid rim anteriorly, which resulted in a permanent weakness of the shoulder joint. He therefore advocated exploration of the shoulder anteriorly by detachment of the tip of the coracoid and division of the subscapularis tendon. The capsule if not torn, is incised to expose the detached labrum. The glenoid rim is then raised with a chisel and the free edge with or without the labrum is sutured to the bony margin. The authors followed this operative procedure and found a tear of the labrum in every case, but in addition they were able to demonstrate erosion of the ventral glenoid rim and found roentgenographic evidence of a defect in the posterolateral portion of the head of the humerus.

Anatomically the labrum glenoidale is a ring of dense fibrocartilaginous tissue, triangular in cross-section, and bound down to the outer edge of the glenoid rim. One surface is in contact with the head of the humerus and the other with the joint capsule. Thus it deepens the concavity of the glenoid fossa. The capsule extends for several millimeters beyond the labrum before it is reflected onto the glenoid rim to form a space between the capsule and the labrum. Anteroinferiorly the capsule is thickened to form the inferior glenohumeral ligament and similarly above to form the superior glenohumeral ligament. The labrum has no capsular support anteriorly except through the glenohumeral ligaments.

At operation the subscapularis tendon was found normal but in 1 instance a number of rice bodies

were found lying below the lesser tuberosity. Vertical capsule tears were found in 6 cases and the glenoid rim was denuded of the fibrocartilaginous labrum. In 4 cases the capsule and labrum were avulsed *en masse* from the entire extent of the anteroinferior glenoid margin. In all cases the glenoid rim was abnormal in appearance, with disintegration of the cartilage and rounding off of the bony rim. In every instance roentgenographic studies of the patients with recurrent dislocations revealed defects of the posterior aspect of the head of the humerus. The authors have linked together these findings to explain the pathological changes in recurrent shoulder dislocation as follows:

The head of the humerus is driven forward onto the glenoid rim anteriorly which tears the anterior capsular attachments. The posterosuperior aspect of the head comes into contact with the posterior glenoid lip which gouges out a portion of the head, if the levering force is sufficient. In a recurrent dislocation the detached labrum and capsule offer no resistance to the dislocating force. Later, secondary arthritic changes as eburnation of the glenoid rim, loose bodies, synovial thickening, and cartilaginous degeneration occur.

In the operative correction the labrum is replaced and the capsule is repaired. This is not always possible and the authors have sutured the posterior portion of the subscapularis tendon to the glenoid rim. The patients have been followed from one and one-half to three years and all but 1 (an epileptic) have good results. The report is otherwise well illustrated and contains an excellent discussion pertaining to the anatomy of the shoulder joint.

DANIEL H. LEVINTHAL, M.D.

Young, R. H.: The Prophylaxis and Treatment of the Stiff Knee Following Fracture of the Femur. *Proc. R. Soc. M.*, Lond., 1942, 35: 716.

A stiff knee is ordinarily brought about by disuse or immobilization. The method used to prevent development of a stiff knee following fracture of the femur is as follows:

With the patient in traction, the sling supporting the leg below the knee is removed. The leg is suspended by a sling under the leg near the ankle. The patient then bends the knee against the resistance of a 2 lb. counter weight. All exercises are ordinarily carried out about three times a day.

An analysis of the results obtained in 34 patients with fracture of the femur showed that 18 patients were treated by early knee movement and 16 without early knee movement. The 16 patients treated without early knee movement had an average of 35 degrees of knee flexion at twelve months. In contrast, the 18 patients who were treated by early knee movement, showed a considerably wider range of motion at different intervals of time. Those persons who had established stiff knees responded very poorly to treatment by faradism and manipulation under an anesthetic.

RICHARD J. BENNETT, JR., M.D.

ORTHOPEDICS IN GENERAL

Moore, B. H.: Macrodactyly and Associated Peripheral Nerve Changes. *J. Bone Surg.*, 1942, 24: 617.

This congenital deformity, sometimes called megalodactyly is rarely seen. It is in fact a localized hypertrophy. The author presents 5 cases. All of the children showed pathological changes in the peripheral nerves, in 1 a neurofibroma and in the 4 others who were younger there was increased endoneural fibrous tissue with degenerative changes in the nerve fibers. Three of the 4 children showed some of the clinical stigmas of neurofibromatosis.

The author believes that the nervous system exerts some controlling influence on the growth process. He favors the neurogenic theory of origin of congenital deformities.

DANIEL H. LEVINTHAL, M.D.

Steindler, A.: Contributory Clinical Observations on Infantile Paralysis and Their Therapeutic Implications. *J. Bone Surg.*, 1942, 24: 912.

The question arises at this time in the treatment of acute and subacute anterior poliomyelitis, whether or not clinical and laboratory experiences warrant radical changes in old principles. Contractures are not always caused by the pull of unopposed strong muscles, and contractures of some kind develop in approximately 25 per cent of the cases in which there are apparently paralyzed muscles. These contractures develop as early as three and a-half weeks and as late as eight months after the onset of the paralysis. Ligamentous relaxation of the joints is observed independently of the muscle involvement. Atrophy of the long bones of paralyzed extremities is shown by discreet bands of absorption in addition to increased translucency and cortical thinning. Sympathetic changes observed indicate that the poliomyelitic limb is hyperhidrotic, hypothermic, and hyperpilomotoric. Experimental investigations suggest that the cause of the hyperhidrosis is peripheral and not central. The factors controlling paralytic scoliosis indicate that it is not merely a case of simple muscle imbalance. Spinal curvature in addition to muscle imbalance may be due to relaxation instability of the skeletal and ligamentous system. Paralytic curves do not develop without muscle involvement, even though additional involvement of the ligament disc is present.

Therapeutically, pain and spasm are relieved by Miss Kenny's splendid technique of hot packs. Splints or sandbags are used intermittently when they offer protection against pain or serve to prevent fatigue. For the treatment of mass movements, Miss Kenny's excellent technique of individual muscle training and selective muscle exercises has also been adopted. The author, however, favors the use of braces in ambulatory cases when the function of standing or walking demands it. In paralytic scoliosis there is ample opportunity for prophylaxis in early treatment. Recumbency, a high vitamin diet, and

physical therapy are used. This refers to paralytic scoliosis in the stage of development only. The moment the curves are fixed, the ligamentous structures and discs are set and the changes are no longer reversible. Then posture is restored by compensation methods. If compensation methods fail, operative procedures may restore posture.

RICHARD J. BENNETT, JR., M.D.

Hart, V. L.: Primary Genetic Dysplasia of the Hip with and without Classical Dislocation. *J. Bone Surg.*, 1942, 24: 753.

Classical congenital dislocation of the hip is secondary to a primary genetic dysplasia of the hip, or flat acetabulum, and develops during intrauterine life, or in the course of the first or second year of postnatal life. Dislocation is a consequence of the primary dysplasia, or "flat socket"; it is a secondary and incidental phenomenon. "Dysplastic acetabulum" is a term now generally accepted, and means a congenital and genetic anomaly of the acetabulum, with hip-joint instability and incongruity. Dislocation can but need not necessarily occur. Primary dysplasia of the hip without dislocation, but with varying degrees of subluxation, is a distinct clinical and roentgenographic entity, and is the one to receive consideration in this paper. Hip dysplasia with potential dislocation in a child one or several months of age may, if not properly treated, become a complete dislocation before or soon after the child starts to walk. There is no "dislocation" gene, but there is a "hip dysplasia" gene. The hereditary factor is not the dislocation, but a primary hip and acetabular dysplasia. The gene involved is not a recessive one, but a dominant gene. The trait of hip dysplasia cannot be linked to sex, because it is observed to pass from father to son.

Dysplasia of the hip without dislocation is a distinct clinical and roentgenographic entity, and should be included in textbooks in the chapter on classical dislocation, because the two entities have the same genetic etiology. Dysplasia of the hip without dislocation occurs more frequently and may be more disabling than classical dislocation because it does not usually become evident until late in life when every chance of cure is gone. Acclivity of the roof of the acetabulum is the primary anatomical feature of a dysplastic acetabulum or flat socket. Hip dysplasia refers not only to the acetabulum, but also to all joint-forming parts of the hip joint. Primary hip dysplasia can lead much more easily to complete dislocation in the female than in the male. Primary hip dysplasia with dislocation on one side is frequently associated with dysplasia without dislocation on the opposite side.

Hip-joint instability and incongruity between the head and socket are the physiological and anatomical expressions of hip dysplasia without dislocation. Primary hip dysplasia may remain asymptomatic for many years; in some individuals it may never be expressed clinically. The extreme disability observed in some individuals is caused by traumatic arthritis of the hip joint resulting from mechanical factors of instability and incongruity. The patient may gain relief from pain and disability by conservative treatment and surgical measures.

Dysplasia of the hip without dislocation, in the author's experience, presents no characteristic clinical signs in the infant. The anomalous hip is recognized during infancy through roentgenographic studies because of dislocation of the opposite hip or in a routine roentgenographic examination of the hips as practiced by Putti. If the condition is recognized in an infant, with complete dislocation of the opposite hip, then the hip without dislocation should be splinted in abduction during the period of immobilization of the reduced dislocated hip. A mildly dysplastic hip in an infant, recognized by routine roentgenographic studies of the hips, however, should not be treated until after the fourth or fifth months, at which time a more certain conclusion can be made.

If a dysplastic hip is present after the fourth month in an infant or child, then treatment in an abduction splint for several months or more is expedient.

Many of the dysplastic hips without dislocation remain asymptomatic for many years. The patients with symptoms of fatigue, pain, and limp should be advised to spare the hip, and refrain from strenuous sports, jumping, and long hikes. A rest period during the middle of the day is beneficial. Obesity must be prevented. The patient's occupation should not require long periods of standing or walking. Lifting and carrying heavy objects should be discouraged. Moderate elevation of the heel of the shoe of the opposite, normal extremity may help to relieve symptoms, since elevation of the pelvis on the normal side will improve stability of the dysplastic hip in the standing position. A crutch or cane is often necessary, and should be used on the normal side to aid the gluteal mechanism and enhance stability of the dysplastic hip. Physical therapy, various forms of hip spicas, roentgenotherapy, manipulation, and traction are measures which may give temporary relief. Conservative measures should always be tried first. If they fail, then operation may be considered.

The disability is caused by hip-joint instability and incongruity during the early years, and by the additional factor of traumatic arthritis during the later years. A perfect shelf operation corrects instability, and therefore improves the patient's condition, but it does not correct the serious factor of incongruity. Therefore, operation may fail if the patient does not continue to guard the hip against overstrain as suggested under the conservative program. Osteoarthritis may develop subsequently as a result of the remaining incongruity of the hip joint.

Arthrodesis of the hip, intra-articular and extra-articular, must be considered in single or unilateral hip lesions after the additional factor of traumatic arthritis has increased the pain and disability.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1. Roentgenographic study of a normal hip (aged two years). A horizontal line is drawn on the roentgenogram through the clear areas in the depth of the acetabula, which represent the triradiate or Y cartilages. This line is called the Y line. A second vertical line is drawn through the lateral border of the acetabulum and the Y line. Normally the capital epiphysis lies below the horizontal line and within the lower medial quadrant formed by the Y and vertical lines. The angle of incidence of the roof of a normal acetabulum is about 20 degrees. This angle is formed by the junction of the Y line with a line passing from the depth of the socket at the Y line through the lateral border of the acetabular roof.

In case of unilateral hip-joint dysplasia, the vertical line is drawn on the normal side; and on the opposite side a parallel line is drawn at an equal distance from the midline.

In hip dysplasia without dislocation, but with varying degrees of subluxation, the capital epiphysis lies below or partially above the horizontal or Y line, but lateral to the vertical line. In hip dysplasia with actual dislocation, it lies above the Y line and lateral to the vertical line.

Note Shenton's line and the tear-drop. Also note the line which measures the distance from the most proximal shadow of the diaphysis to the Y line.

Fig. 2. Note the characteristic features of hip dysplasia with added secondary changes of traumatic arthritis, manifested by loss of joint space, sclerosis, cystic areas of rarefaction, double acetabular floor, osteophytic deposits, and capital drop. The patient is now sixty years of age and walks with the aid of a crutch. Her mother was disabled with classical hip dislocation.

Fig. 3. The patient had bilateral hip dysplasia with dislocations which were reduced by Adolf Lorenz in 1903 when the patient was three years of age. Note the signs of bilateral hip dysplasia with added changes of traumatic arthritis. The patient is now seriously disabled at the age of forty-two years. Her sister has hip dysplasia without dislocation, but with secondary changes of traumatic arthritis.

Watson-Jones' nail-fixation, arthroplasty, and McMurray's osteotomy should also be included in the possible surgical methods to relieve pain and disability of the dysplastic acetabulum associated with traumatic hypertrophic arthritis.

ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Dandy, W. E.: Results After Ligation of the Internal Carotid Artery. *Arch. Surg.*, 1942, 45: 521.

In prelisterian day the surgical mortality rate from carotid ligation was frequently above 50 per cent. Since the introduction of aseptic surgery a remarkable decrease both in the mortality and postoperative morbidity followed. However, the same sequence of events occurs with and without sepsis; the only difference is in relative frequency. The causes of death and disability are: (1) cerebral anemia from inadequate collateral circulation through the circle of Willis, the effects of which appear immediately and may be abrupt and progressive, and (2) cerebral thrombosis and embolism, the effects of which are late and may develop from twelve hours to several days later; their occurrence is usually abrupt, although at times a preceding small attack may warn of the impending event. The author showed that by care in the preoperative tests for the adequacy of the collateral circulation in the brain and by the proper choice of methods of ligation these risks can now be largely eliminated.

In presenting a series of 88 ligations, partial and total, it is pointed out that there were immediate cerebral complications in 4, or 4.5 per cent; late cerebral complications in 1, or 1.1 per cent; and death in 4, or 4.5 per cent.

Partial ligation in the neck was accomplished with fascial bands in 25 cases. There were immediate cerebral complications in 3 cases and death occurred in 1 case. Total ligation in the neck was done in 36 cases: in 7 cases it was done after partial ligation, and in these 7 there were no immediate or late cerebral complications, but 1 death occurred; in 12 cases it was done after intracranial clipping of the carotid, and in these 12 there were no cerebral complications or deaths; in 17 cases it was done without any prior attack on the artery, and in these 17 there were no immediate cerebral complications, but in 1 there were late complications followed by death.

The internal carotid artery was clipped intracranially in 27 cases. In 6 the clipping was done after ligation in the neck without cerebral disturbance or death; and in 15 it was done without prior attack on the artery in the neck, and in 1 of these there was an immediate cerebral complication.

The author believes that the Matas test, which demonstrates the relative efficiency of the collateral cerebral circulation is all-important in order to avoid disaster following immediate total ligation of the internal carotid artery. After partial ligation with fascial bands a total occlusion can be safely performed in from one to two weeks. Clipping of the internal carotid artery intracranially is relatively safe and is essential in treating many intracranial aneurysms. ANTHONY F. SAVA, M.D.

Barnes, J. M., and Trueta, J.: Arterial Spasm. *Brit. J. Surg.*, 1942, 30: 74.

The purpose of this article is to report findings in the experimental production of arterial spasm in the limbs of rabbits, and to discuss the possible significance of the findings. The work was begun in an attempt to find an explanation for some of the changes seen in the limbs of patients with so-called "crush syndrome." In the literature there were reports of cases presenting clinical evidence of impairment of the circulation to the injured limb, e.g., coldness, edema, and the development of blisters. There was no evidence of gross damage to the main artery, or of the presence of emboli. The question occurred that the initial injury might have set up spasm in the main arteries, the spasm persisting after the release of the victim.

The experimental investigations were carried out on brown rabbits. An inelastic tourniquet of soft wire placed inside a piece of rubber tubing was used. The wire was tightened with pliers until it was certain that the arterial blood supply had been shut off. A severe and persistent arterial spasm could be produced in the legs of rabbits by means of this type of tourniquet when it was left in place for four and one-half hours. The spasm was seen to persist for as long as seventy-two hours, in the animals allowed to survive for longer periods, a condition of the muscles similar to Volkmann's ischemic contracture developed. The spasm affected the main arteries and also the collaterals of the injured limb. Segmental spasm of the main artery of the opposite uninjured limb was also clearly seen in many of the animals.

That an artery responds to direct violence by going into spasm is a fact well known to operating surgeons. This direct type of injury will explain the spasm seen in cases during the last war when missiles passed close to the main arteries; it will also explain the case of Volkmann's contracture following fracture in which a bony spicule has actually damaged the vessel wall. What is not so well known is that a less direct type of injury may give rise to a similar picture. Thus Volkmann's contracture may follow a crush or blow that does not fracture the bone.

The reasons for the persistence of the spasm are more difficult to assess. In cases in which spasm followed bullet wounds the condition tended to pass off spontaneously and apparently caused no permanent damage to the structures of the limb. This may be due to the fact that the initial injury was either mild or transient. In certain cases of Volkmann's contracture a bony spicule may be lodged against the artery wall and give rise to a persistent irritation. The importance of this type of injury was borne out by these experiments in the use of a different type of tourniquet. In another series of rabbits soft rubber tourniquets were applied for the same length of

time. Though the legs become swollen after their release, the persistent stiffness and paralysis were never noticed, and arteriographs made of 2 of these animals showed a normal vascular picture. The significance of the spasm in the main artery of the uninjured limb lies in the apparently widespread vascular reaction to a comparatively localized trauma. In the case of the leg of the experimental animal, no ill effects were noticeable, but this might not necessarily be the case were the vessels serving a more vital organ which was injured and sent into spasm.

The authors observed that local infiltration of the sympathetics with novocaine failed to relieve the spasm within forty minutes. Removal of the sympathetic chain after release of the tourniquet improved the general circulation to the limb although traces of spasm in the main trunks were often seen. It would seem that while the local effect on the damaged artery may be myogenic in origin, the reflex closing of the collateral circulation is brought about by the stimulation of the sympathetics.

HERBERT F. THURSTON, M.D.

Brown, R. K., and Mehnert, R. H.: Aneurysm of the Temporal Artery. *Surgery*, 1942, 12: 711.

The authors note that the history of the treatment of peripheral aneurysms dates back to antiquity. In the third century Antillus used double ligature, incision, and packing. In the fourth century excision was advocated. Then in the eighteenth century Hunter demonstrated the value of ligation at a distance, proximal to the arterial branches.

The advisability of the last procedure obviously depends upon the regional anatomy and the degree of enlargement of the anastomotic channels. The danger of circulatory deficiency and gangrene, which is of paramount importance in the management of many peripheral aneurysms, is of no significance in the temporal region because of the rich anastomoses of the branches of the external carotid artery. Reference is made to a review of temporal aneurysms made a few years ago by Winslow and Edwards. They tabulated the complete data on cases from the literature, 9 of which were spontaneous, 79 traumatic, 5 unclassified, 15 arteriovenous, and 10 doubtful. The authors have been unable to find records of any cases of spontaneous traumatic aneurysm other than the 9 listed in the report cited above.

The patient described herein, a male aged thirty-four, presented himself for treatment only because of the enlarging tumor. There was no pain or any other symptom. The size of the tumor increased with gradual acceleration over three years. In the treatment, operative incisions were placed to give adequate exposure and at the same time leave no noticeable scars. The external carotid artery was ligated. The artery above the aneurysm was also ligated. After dissection from its bed, the artery then at the lower pole of the aneurysm was also ligated.

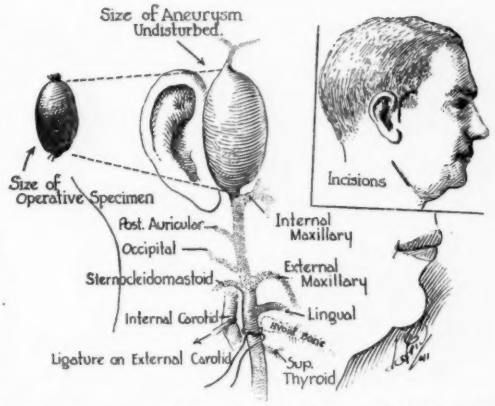

Fig. 1. Schematic drawing showing in solid lines the vessels that were seen at operation.

The extreme elasticity of the thin-walled aneurysm was a striking feature of the operative findings. The volume of the specimen as it was removed was apparently only about one-third of the volume of the aneurysm before interference (Fig. 1).

In conclusion the authors note that aneurysm of the temporal artery is a rare condition which is usually post-traumatic. This case of spontaneous true aneurysm is apparently the tenth of its kind to be reported. Cure was easily and safely effected by excision after ligation of the external carotid artery.

HERBERT F. THURSTON, M.D.

Atlas, L. N.: A Complicated Case of Aneurysm Involving the Iliac and Femoral Arteries. *Ann. Surg.*, 1942, 116: 708.

This case of iliofemoral aneurysm is reported because of several unusual features which complicated its management. The patient, a male, stated in his history that thirty-eight years before he had been shot through the inner aspect of his left thigh. An "aneurysm," probably an arteriovenous fistula, developed at the site of the wound and was excised. Three years later a pulsating mass in the left groin spontaneously appeared. During the thirty-five years that followed, this mass had slowly increased in size and was becoming painful. In addition he was suffering from chronic ulceration of the leg, intermittent claudication, and extreme coldness, numbness, and cyanosis of the foot.

Because of the obvious vasospasm, it was deemed advisable to precede excision of the aneurysm by a lumbar sympathectomy. This was done and after four months had elapsed, the femoral portion of the aneurysm was exposed through a vertical incision. A length of umbilical tape was placed around the sac just above the orifice of the deep femoral artery and tied. Nutrition of the foot was maintained. Two weeks later the iliac portion of the aneurysm was exposed through a suprainguinal extraperitoneal

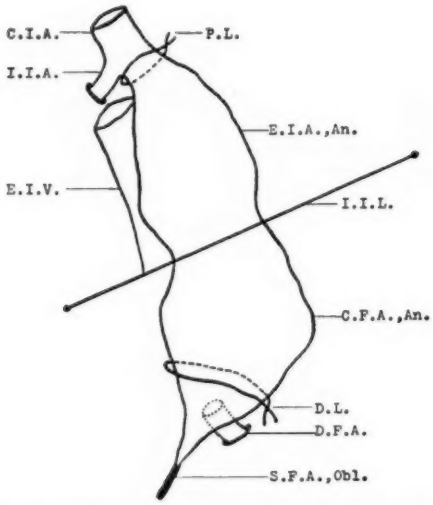

Fig. 1. Diagrammatic sketch of operative findings and procedure. C.I.A.—Common iliac artery; I.I.A.—internal iliac artery; P.L.—proximal ligature; E.I.V.—external iliac vein; excised along with E.I.A.—aneurysmal external iliac artery; I.I.L.—ilioinguinal ligament; C.F.A.—aneurysmal common femoral artery; D.L.—distal ligature; D.F.A.—deep femoral artery; S.F.A.—obliterated remnant of superficial femoral artery. (Courtesy of J. B. Lippincott Co.)

approach. The aneurysm extended up to the origin of the internal iliac artery. A ligature of umbilical tape was placed just distal to the origin of this artery, and the entire aneurysmal portion of the external iliac together with the accompanying vein were excised down to their disappearance into the thigh.

When examined six months later the foot was pink and warm and in an excellent state of nutrition. The leg ulcers had remained healed. There were no symptoms of ischemia other than a mild degree of intermittent claudication. The residual portion of the aneurysm had been converted into a fibrosing, nonpulsatile mass which had already shrunk to about one-quarter of its original size.

In working with selected cases of arteriosclerotic disease of the lower extremities, the authors have been able to demonstrate that there is a slowly progressive increase in the magnitude of measurable arterial pulsation in the region of the lower leg over a period of from six to twelve months following lumbar sympathectomy. The observations can be explained only on the basis of a development of a collateral circulation in response to the surgically induced relaxation of the peripheral small vessel bed.

The case reported herein supports the conception that increased sympathetic vasoconstrictor tone may play an important role in the failure of a collateral circulation to develop spontaneously following a major arterial block. The inadequacy of the collateral circulation in this instance can be best explained by the inhibiting influence of the associated vasospasm. To have thrown an added burden on this meager collateral circulation by primarily excising and thrombosing the aneurysmal iliofemoral artery would surely have resulted in gangrene of the foot and leg. For that reason it is believed that the lumbar sympathectomy was a crucial maneuver in the maintenance of an adequate blood supply to the foot and leg. HERBERT F. THURSTON, M.D.

Tarnower, H., Lattin, B., and Adie, G. C.: Successful Closure of an Arteriovenous Aneurysm Involving the Left Innominate Vein and the Left Common Carotid Artery. *Ann. Surg.*, 1942, 116: 700.

Arteriovenous aneurysms are fairly common and rather easily recognized by the classic physical signs which are invariably present, with possible minor variations. The authors describe in detail their experiences with an arteriovenous aneurysm which was unusual in its location. The difficulties encountered in the surgical correction of the condition were considerable. The patient was stabbed in the chest. Six months later the operation, reported herewith, was done to repair the aneurysm between the left innominate vein and the left common carotid artery. Because of the friable nature of the sac, the aneurysm was closed by the application of three artery clamps. The last of these was removed on the fourteenth postoperative day with no untoward results. When seen two years later the patient was working in a munitions factory and lifting heavy weights without discomfort.

Arteriovenous fistulas may be either acquired or congenital. Both types produce local circulatory disturbances, and, if large enough, profound systemic effects. The most common arteriovenous aneurysms are those involving the femoral, axillary, brachial, popliteal, carotid, and subclavian vessels. The case reported here is the second one recorded in which a fistula had connected the left internal carotid artery and the left innominate vein.

The classic local signs are a continuous bruit and thrill, which are accentuated during systole and transmitted along the line of the vessels. This may be modified by the position of the arteriovenous aneurysm. The local manifestations, in most instances, are of little consequence; a notable exception is the arteriovenous aneurysm involving the internal carotid artery and the cavernous sinus, in which condition the local changes greatly overshadow the systemic disturbances.

The systemic phenomena which may occur with an arteriovenous aneurysm are: (1) an accelerated heart rate; (2) an elevation of the systolic arterial blood pressure and a lowering of the diastolic pressure, with a resultant increased pulse pressure; (3) an increased cardiac output with a decreased stroke output; (4) engorgement of the pulmonary vessels; (5) an increased circulating blood volume; (6) cardiac enlargement; (7) electrocardiographic changes;

and (8) increased venous pressure and circulation time, with the onset of cardiac decompensation. The authors note that the effects of an arteriovenous aneurysm are dependent upon the size of the fistula, the caliber of the vessels involved, the distance of the fistula from the heart, the volume and force of the arterial stream which is short-circuited, the age of the patient and his activity, and the presence or absence of coexistent cardiovascular disease.

The time-honored surgical treatment for arteriovenous aneurysm has been a four-point ligation and removal of the fistula. The end-results secured by the authors in this case are evidence of the fact that radical procedures are not always necessary. In desperate cases, in which cardiac decompensation is severe, one may have to resort to simple ligation of the proximal portion of the vein for temporary alleviation. The fact of the matter is that it is often impossible and occasionally extremely dangerous to perform a four-point ligation.

Unfavorable effects upon the general circulation are the usual indications for surgical intervention. Occasionally local changes alone may be troublesome or serious enough to require correction.

HERBERT F. THURSTON, M.D.

Fine, J., Frank, H. A., and Starr, A.: Recent Experiences with Thrombophlebitis of the Lower Extremity and Pulmonary Embolism. *Ann. Surg.*, 1942, 116: 574.

The authors note that studies of the statistical data in the recent literature of thrombophlebitis and pulmonary embolism show (1) that approximately 1 of every 17 to 20 persons with clinically recognizable thrombophlebitis of the deep veins of the lower extremity will die of embolism, and (2) that 1 person of every 6 to 12 who have survived one or more attacks of embolism will die of a subsequent embolus. Since the great majority of pulmonary emboli, except those of cardiac origin, have been shown to arise in the deep veins of the lower extremity, a direct attack upon the site of origin is possible.

Since the use of heparin has certain obvious disadvantages other effective techniques are urgently called for. The procedure of dividing the femoral vein as a prophylactic measure against embolism in isolated instances of thrombophlebitis of the lower leg has not acquired the vogue which it deserves. In a series of patients so treated by these authors, (1) embolism did not occur, and (2) the phlebitic process in the leg subsided, in some instances at a remarkable rate. Pain decreased or disappeared in a day or two, and edema, when present, frequently began to subside more quickly than might be expected.

The experience of the authors with a second group of patients who were studied with the aid of the venographic technique of Bauer is the subject of this report. The technique of venography is described in detail as well as the interpretation of the venogram. A detailed report of the venographic studies together with the clinical histories of 20 patients is presented. Further experience, based on a policy of division of the femoral vein for the prevention of embolism in all cases of thrombophlebitis of the deep veins in the lower leg, has led the authors to conclude that the division of the common femoral vein will cause early resolution of the thrombophlebitic process in the lower leg. Edema of the lower leg appears not to be aggravated; indeed, the process frequently disappears more rapidly than might be expected. In occasional instances edema increases after vein division, but there is no valid reason for attributing the result to vein division. The former practice of dividing the femoral vein, by preference below the entrance of the vena profunda, has been abandoned in favor of division above, because of an occasional instance of embolism from the vena profunda. When thrombophlebitis of the lower leg is present, division of the common femoral vein is preferable to heparinization or paravertebral novocain block as a prophylactic measure against embolism.

There are occasional individuals in whom the process does not remain confined to the deep veins in the lower leg. A new focus of thrombosis above the site of vein division may develop and embolism may then occur. In this event the patient must be reclassified as one with iliofemoral thrombophlebitis and treated accordingly. The treatment of iliofemoral thrombophlebitis by clot or thrombus extraction via the common femoral or iliac veins, followed by division of either of these veins is a valuable and at times indispensable procedure. It need not be adopted as a routine measure. Heparinization or paravertebral novocain block may be as satisfactory or even superior for the purpose of securing symptomatic relief. However, if one infarct should occur, regardless of what type of management has been in effect, it is the view of the authors that division of either the common femoral or iliac vein above the site of the clot or thrombus should be performed, after the latter's extraction.

Venography is an indispensable technique for the correct management of all types of thrombophlebitis of the lower extremity. A filling defect in the venogram does not prove the presence of thrombophlebitis unless the element of vasospasm can be ruled out. Until an effective method for achieving this during venography becomes available, the venogram should be interpreted in the light of the concomitant clinical picture.

HERBERT F. THURSTON, M.D.

BLOOD; TRANSFUSION

Bagdasarov, A.: Blood Transfusion in the U.S.S.R. *Brit. M. J.*, 1942, 2: 445.

The widespread use of blood transfusion in Russia was preceded by much research and the number of transfusions has increased year by year. During the year 1935 the total number of blood transfusions amounted to 22,000, and this figure had increased to 200,000 in 1940. All physicians are trained to give blood transfusions, and 1,500 special institutes and stations have been opened in all of the larger cities

and towns for taking blood and preparing it for transfusion.

There has been no difficulty in securing donors. The author states that since the beginning of the war an endless stream of donors has been contributing blood to the Soviet soldiers.

It has been found that if glucose is added to the citrate, the blood will keep for a considerable length of time. Blood that is not shipped will keep for a period of twenty-five days, and blood that is shipped will keep for twenty days. Thousands of liters have been shipped to the front by airplanes.

Soviet physicians have made a practice of using Group O (Type IV) blood for indiscriminate transfusions since there is rarely time at the front for blood typing.

Russia has also recognized the use of plasma and has used both frozen and dried plasma in the front lines. It has been found useful as a highly hemostatic agent in cases of protracted loss of blood, in shock, and in burns.

The blood cells, separated from the plasma, are suspended in various balanced physiological solutions and used in those cases in which erythrocytes are urgently needed. The erythrocytes so treated may be used for a period of twelve days.

Wide application of blood and plasma transfusions has not prevented the use of plasma substitutes. Such substitutes have consisted of balanced physiological solutions containing a small volume of blood or plasma. Other solutions have their colloidal properties ensured by the use of specially processed casein.

Perhaps the outstanding feature of Russian blood therapy is the tremendous number of Soviet civilians who daily volunteer their services as donors. These volunteers come from every class of society: workers, students, militia, housewives, and wives of soldiers. Their numbers are so great that the transfusion centers are busy from early morning until late at night. ROBERT D. MANSFIELD, M.D.

Levine, M., and State, D.: A and B Substances as a Cause of Reactions Following Transfusions. *J. Am. M. Ass.*, 1942, 120: 275.

The authors note that the use of plasma and serum in the treatment of shock has become widespread as it offers advantages over whole blood in that both plasma and serum are more easily stored, transported, and administered. Many workers have stated that plasma in a reasonable quantity may be administered safely regardless of the blood group. They have reasoned that the isoantibodies in the transfused fluid would be diluted by the recipient's blood beyond the point at which it would agglutinate the recipient's cells. Others have emphasized the role of these same antibodies in causing transfusion reactions and have urged that either compatible plasmas be used or pooling be employed to decrease the titer of the antibodies.

A series of 6 cases that reacted to the transfusion of either group specific plasma or purified A and B substances is presented. From these it is obvious that the A and B substances present in the plasma and the purified combined A and B substances may cause reactions after intravenous administration in sensitive persons. This sensitivity is not associated with any particular blood group in the recipient or in the donor. It occurs when the recipient has the antibody corresponding to the administered antigen, but not every person having the antibody will react to the transfused antigen. The reason for the existence of sensitivity in certain individuals remains to be explained. The condition may merely be a quantitative phenomenon.

In the last 500 routine transfusions of plasma at the University Hospitals, Minneapolis, Minn., the reactions occurring have all been traced to the A or B substance in the plasma. Since many hospitals are now preparing their own plasma, it becomes a matter of great importance that these reactions be avoided.

The absence of such reactions when the cutaneous tests are negative suggests the use of such tests as an adjunct to plasma therapy. This is true especially of unpooled plasma. The authors conclude that since purified A and B substances give rise to reactions, more work on these substances is necessary before their use in universal donors become routine.

HERBERT F. THURSTON, M.D.

Ravitch, M. M., and Chambers, J. W.: Spirochetal Survival in Frozen Plasma. *Bull. Johns Hopkins Hosp.*, 1942, 71: 299.

The rapid increase in the popularity of blood banks throughout the country, and, particularly, the accumulation of large stores of plasma—liquid, frozen, or dried—have made study of the survival of the treponema pallidum in these various preparations of great importance.

The blood bank of the Johns Hopkins Hospital has been using simple frozen plasma, not desiccated, for a year. Whenever possible the blood is centrifuged within twenty-four hours of its drawing; the plasma is drawn off, pooled, redistributed, and frozen within the next twenty-four hours. No plasma is released until cultures have been sterile for a week. There is thus a minimal period of nine days between bleeding and the earliest permissible use of the plasma—two days the plasma is kept at ordinary refrigerator temperature and seven days at −20°C. in a freezing cabinet. The freezing requires from three to four hours. Thawing in a water bath at 37°C. requires thirty minutes.

In a series of experiments human and rabbit plasmas were heavily inoculated with the treponema pallidum and frozen at −20°C. for forty-eight hours or longer. These plasmas were found to be not infectious for normal rabbits. They were infectious, however, if the freezing period was only twenty-four hours. Under these conditions, the incubation period is prolonged, even though the experimental animals received an inoculation dose twice the size of that given the controls. SAMUEL KAHN, M.D.

RETICULOENDOTHELIAL SYSTEM

Campiche, P.: The Indications for Splenectomy Used as a Basis in the Classification of Splenic Disorders. *West. J. Surg.*, 1942, 50: 463.

The positive indications for splenectomy are as follows:

1. Blood dyscrasias with splenomegaly. These are conditions in which the origin of the trouble actually is in the spleen or in which splenectomy, done at the proper time, has been proved to have a curative effect.
   a. Hemolytic icterus. This condition seems to be the best field for splenectomy, as evidenced by the low mortality and the brilliant results of the operation.
   b. Banti's hepatosplenic anemia. Even in advanced cases, good results may be secured if a preliminary omentopexy is done in preparation for the splenectomy.
   c. Essential thrombopenia—idiopathic purpura. In mild and moderate cases medical treatment should be tried first. In acute and severe forms, operation should be done as soon as the diagnosis is established.
2. Diseases of the spleen proper
   a. Ptosis, with repeated attacks of torsion of the pedicle
   b. Injuries
   c. Diseases of the splenic vessels: aneurysm of the splenic artery, embolism of this vessel, and possibly thrombosis of the splenic vein.
   d. Cysts and primary tumors of the spleen

The relative (selective) indications for splenectomy are:

1. Blood dyscrasias with splenomegaly
   a. Gaucher's disease. Splenectomy is not curative, but affords good palliation.
   b. Anemias with splenomegaly
      (1) Sickle-cell anemia
      (2) Cooley's anemia
      (3) Pseudoleucemic anemia of children
      (4) Lymphoblastoma (Hodgkin's disease)
2. Diseases of the spleen proper
   a. If a patient has an idiosyncrasy for certain drugs (quinine, arsenic), or if he should prove refractory to them, the spleen may be removed at the request of the internist, in order to relieve the patient of the weight of the splenic mass and to do away with a large reservoir of parasites, especially in lues and malaria.
   b. In dealing with infections, the removal of the spleen may be indicated if the original lesion (the origin of the infection) is healed and the spleen contains a single focus.

The contraindications to splenectomy are:

1. Blood dyscrasias with splenomegaly
   a. Pernicious anemia
   b. Polycythemia
   c. Hodgkin's disease of the lymph nodes with secondary invasion of the spleen
   d. Leukemia
2. Diseases of the spleen proper
   a. Infections
   b. Parasites: kala-azar, distomiasis, echinococcus disease, trichinosis, filara lymphatica, and other infections from worms
   d. Metastasis of malignant growths

SAMUEL KAHN, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Downing, J. G.: Trauma of the Skin Due to Wartime Activities. *N. England J. M.*, 1942, 227: 539.

Recognition of industrial dermatitis may often prevent similar occurrences in military life. An outbreak of dermatitis in workers at a plant in which raincoats were being made was found to be due to the presence of free sulfur in the material. The use of these coats would have irritated the skin of soldiers wearing them. In another plant, the use of a new synthetic resin finish caused a marked dermatitis among the employees. The same finish had been applied to cloth intended for the Army personnel. If the cloth had not been withdrawn, an outbreak of disabling dermatitis would have affected many soldiers.

The possibilities for cutaneous diseases in military life are similar to those in industrial and civilian life; we may find sensitivity to substances varying from clothing, to cinnamon powder or the persulfates, as well as burns from explosives and gases. In military encampments, however, especially during active service, these diseases become of major consequence because of the close crowding of the men and the lack of suitable bathing facilities.

Most occupational dermatoses can be prevented. Hazards must be detected and eliminated. Mechanical devices should replace manual contacts, and if this is impossible gloves should be worn or protective creams should be applied. Workers should be taught the value of cleanliness. No new substances should be introduced until their possible effects on workers have been studied.

In military medicine the best method of prevention is the instruction of medical officers in the early recognition of dermatoses, careful inspection of newcomers to camp, and the segregation of those with contagious cutaneous disease. Treatment of these diseases should be by accepted, proved therapy.

SAMUEL KAHN, M.D.

Smith, A. D.: The Modern Treatment of Burns. *Med. J. Australia*, 1942, 2: 335.

The author discusses the treatment of burns under the following subdivisions: (1) first-aid treatment for patients a short distance from the hospital or treatment center; (2) first-aid treatment for patients who must be transported a considerable distance; and (3) hospital treatment for the local condition, and resuscitation measures when these are indicated.

In the first instance, sterile dressings of sodium bicarbonate solution are indicated. In the second, tannic-acid jelly (5 per cent), tannic-acid spray (2.5 to 5 per cent), and triple dye are equally efficacious. For third-degree burns of the face, the flexures, or the fingers or toes, tanning is not recommended. Bad results are said to have followed the tanning of these areas, because of the constriction produced by the eschar. In addition, morphine, fluids, and sulfanilamide are used early in the treatment.

Treatment of the patient when he reaches the hospital depends upon the severity and extent of his burns. Local treatment consists of removal of the tan, if present, and use of the saline bath, sulfanilamide powder, and the *tulle gras* technique. Upon the admission of burn patients to the hospital, hematocrit and plasma protein estimations are carried out. This is followed by the administration of indicated fluids. Patients with the most serious burns are placed in saline baths at once, whether or not a tanning agent has been applied. Smaller baths are used for the extremities; if baths are not available, saline packs may be applied. The bath is kept at from 90 to 95° F. The saline solution should be of 1 per cent strength (1 lb. of salt to 10 gal. of water).

The patient is kept in the bath for an hour or more, if it is well tolerated, and during this period blisters are snipped, debris is floated off, and tan is separated. On the removal of the patient from the bath, sulfanilamide powder is sprayed on the burned areas, and *tulle gras* and moist saline are applied. This process is repeated once or twice daily. Sulfanilamide is given by mouth in severe cases.

In some cases the patient is more comfortable if the dressings are kept moist. Dressings should be floated off, not pulled off. *Tulle gras* should be applied only one layer thick, and should not be too greasy. It is made by impregnating coarse mesh gauze with vaseline containing 2 per cent balsam of Peru. The material is cut in 6 in. squares and is sterilized in tins by autoclaving for twenty minutes at 250° C.

If skin grafting is to be carried out, cultures are taken following the application of saline dressings for a period of one day. If streptococci are found sulfanilamide powder is used for three days, followed by saline solution for one day, and the cultures are repeated. When a negative report is received, skin grafting is carried out.

For staphylococcal and bacillus-coli infections, eusol compresses are used. For bacillus pyocyaneus infections, a 1 per cent aqueous solution of acetic acid is efficacious.

No pedicled grafts have been necessary since saline baths have been used. Lanolin, massage, and active movement have helped to prevent contractures. The author ascribes the success of treatment of the more severe types of burns to the use of sulfanilamide and serum coupled with the saline bath and early skin grafting.

JOHN A. GIUS, M.D.

Richardson, F. McD.: The Modern Treatment of Burns. *Med. J. Australia*, 1942, 2: 337.

The primary derangement of physiology seen following burns is loss of plasma from the bloodstream

with resultant alterations in the osmotic and fluid balance of the body. The best treatment is obviously replacement of the lost elements. Electrolytes in solution decrease effective osmotic pressure and increase tissue edema, while whole blood adds quantities of red blood cells to an already overburdened circulation. Plasma is therefore the solution of choice. The question of when and how much to administer is best determined by repeated hematocrit and plasma-protein estimations.

A high or rising hematocrit value is evidence of present or approaching hemoconcentration and is an indication for the administration of fluid. A low or falling hematocrit value means blood loss and is an indication for replacement therapy. The type of fluid is determined by the immediate past history and the plasma protein values. Falling protein values indicate the need for protein, while rising protein values indicate the need for water. Following hemorrhage, blood is best for replacement therapy.

Plasma loss in burns if untreated may continue for from thirty to forty hours, and during this period plasma therapy is essential. The author believes that plasma therapy should be commenced immediately and maintained vigorously as long as the tests reveal a continuation of plasma protein loss. Treatment is aimed at decelerating and then reversing the process of plasma protein loss and, therefore, when indicated, plasma must be used in large quantities to insure good results. JOHN A. GIUS, M.D.

Ainslie, J. P.: The Modern Treatment of Burns. *Med. J. Australia*, 1942, 2: 339.

The severely burned patient presents two immediate problems: the saving of the patient's life and the prevention of infection. Life is saved by the prevention and treatment of shock, which treatment is fairly well standardized. The author favors the use of 5 per cent tannic-acid spray alternated with 10 per cent silver-nitrate solution. Treatment of the burned area as an open wound with adequate protection from contamination together with extensive and thorough cleansing before the tanning agents are used is essential for success.

Deep burns will become infected under the tan and it is advisable to apply skin grafts as early as possible in these cases. Such burns may be covered with skin grafts immediately after the excision of devitalized tissue. Early grafting likewise prevents contractures and deformities. The restoration of function in areas where contractures have occurred is frequently a long and trying task involving the use of all forms of grafts, but the results are well worth the effort. JOHN A. GIUS, M.D.

Kirk, N. T.: Amputations in War. *J. Am. M. Ass.*, 1942, 120: 13.

In a pithy discussion of amputations in general and the guillotine amputation in particular, Kirk lays down certain broad principles which he illustrates in a description of the present-day use in war work of the so-called guillotine operation. He points out that this is not a chop amputation, but that the skin, fascia, muscles, and bones are individually divided at a higher level so that the stump is concave, the sawed end of the bone being shorter than the skin, fascia and muscle layers. The periosteum is never removed from the bone in the guillotine operation. The site of the amputation should be at the lowest level possible regardless of the utility of the stump, and in the secondary or delayed guillotine operation, the saw line should be as low as is consistent with saving the patient's life and removing the focus of infection.

The author believes that the valuable use of the sulfanilamide derivatives still does not make primary suture safe in extremity surgery under war conditions. In his postoperative care he advises immediate skin traction, with the application of either 2½ in. adhesive or a stockinette of proper size to the skin of the stump with Ace adherent. The wound is protected by bismuth, iodiform paste, or petrolatum, with sulfanilamide or a mixture of sulfathiazole and sulfanilamide rubbed into the stump end. Frequent wound dressing is contraindicated unless severe infection ensues and the traction must be continued until the wound heals, about six weeks in the thigh.

In the later repair of the guillotine stump, if the scar tissue at the stump end is excised *en masse* through healthy skin and dissected from the fascia and the muscle to the bone, and this scar is adherent to the bone, a small ⅛ in. layer of bone is excised with the saw and a plastic closure accomplished by undercutting the skin from the fascia. The suture line is permitted to fall where it will, but before any repairing of a guillotine stump is attempted, x-rays should be taken to determine the health of the bone end. While sulfanilamide or sulfathiazole are used freely, these drugs can never take the place of adequate surgery. PAUL C. COLONNA, M.D.

Blinoff, N.: Surgeons and Surgery in Leningrad. (Cable received by the Anglo-Soviet Medical Council.) *Brit. M. J.*, 1943, 1: 134.

"Leningrad has been besieged for over a year now. The absence of a normal influx of food products (at one time its complete cessation) and the severe bombardment have had their effect on the life of the town and in particular on the work of the surgeons.

"The beginning of the siege was heralded by violent air raids and frequent bombardments, as the result of which there were a large number of wounded among the civilian population. It became necessary to open new surgical wards in already existing hospitals and even to create new hospitals. The civilian hospitals were all transformed into military ones and also served as evacuation hospitals. The wounded were admitted straight from the battle front, after first-aid treatment only. The ordinary surgical work of the town had to be done in addition to this.

"The deficiency of food and the use of 'food substitutes' have changed the type of patients admitted to the hospitals. There were very few patients with acute appendicitis, but the number of cases with

perforated gastric ulcer increased more than tenfold as compared with peacetime, and there were very many with strangulated hernia and obstruction. There was an especially large number of cases with coprostasis on account of the faulty and rough food.

"Planned surgical operations were not performed; only emergencies were done. The usual principles of treatment of gunshot wounds were observed: excision of the edges of the wound, etc.; the wounds were not sutured. In some clinics a sulphonamide was applied locally. Fractures from gunshot wounds were, as a rule, treated by plaster dressings; extension was seldom applied as the wounded had to be moved from one hospital to another. The method of closed plasters left on for a long period was used widely. In the treatment of shock, blood transfusions, blood replacements, and anti-shock solutions were extensively employed. There was no shortage of blood or of solutions. The Blood Transfusion Institute began scientific and practical work on the method and technique of preparation of different blood-replacing solutions. Some surgeons made a habit of using sphagnum moss for surgical dressings.

"As surgeons had for the most part been mobilized, there were not many left to serve the civilian population. Short two-week courses were organized by the Postgraduate Institute and new cadres of surgeons were formed. Several hundred doctors received postgraduate training in that way. Two scientific conferences were held in October and November, 1941, to discuss methods and results: 500 doctors attended and 17 addresses were delivered on a variety of subjects.

"Then severe cold weather set in; on account of extensive damage the electricity supply failed in most of the buildings, so work had to be done with the aid of oil-lamps or night-lights. Then the water supply gave out. There was very little coal for central heating and practically no wood, so the temperature of the wards, operating theatres, and dressing stations was very often at freezing-point. Temporary stoves were installed, and by using fences and wooden huts as logs the staffs of the hospitals were able to raise the temperature several degrees above freezing-point. The doctors made their rounds in fur overcoats covered by white gowns, and dressings had to be performed in the wards. The wounded often had to lie in bed fully dressed. The author of this article frequently had to do blood transfusions in a fur coat and a fur hat and keep his hands warm by putting them in warm water. Only in the older hospitals could some of the work be performed in the operating theatres. Later the number of surgical cases diminished abruptly and surgical beds could be filled by medical cases.

"The severe cutting down of rations and the intensely cold weather produced a peculiar disease—an alimentary emaciation, which appeared in different forms (oedematous and dry) with a variety of surgical complications such as gangrene of fingers, trophic ulcers, etc. This was followed by avitaminosis. With the advent of the spring surgeons began to get active again. In April, 1942, the first surgical conference of the year was held: 150 civilian and military surgeons were present. After that regular meetings were held every third Sunday. There were several scientific conferences on blood transfusions, trauma, etc. It showed that surgeons were active even during the worst part of the blockade. Most of the debates and meetings were on treatment of different types of wounds, but some of them dealt with other subjects, such as conservation of blood, preparation of dry plasma, and transfusion of sterile homo- and heterosera. One meeting was devoted to the question of alimentary emaciation and its treatment by transfusion of blood, plasma, and blood-replacing solutions, and also by the use of blood preparations (ferrohaematogen compound). The biochemical laboratory of the Institute gave a detailed account of the biochemical changes in the blood of emaciated patients. Altogether 22 lectures were given. Two conferences were held at the Traumatological Institute. At the conference held in September, 1942, and organized by the town council's health department 400 surgeons attended. Samarin gave a lecture illustrated by 200 cases on the marked action of sulphonamides on the healing of gunshot wounds. Blinoff dealt with the classification of complications after blood transfusion. Kasakevitch and Nadein summarized their experience of 1,000 cases of gunshot fractures treated by the application of closed plasters. Epstein reported on contractures due to scurvy. A special meeting was devoted to wounds of the chest. In spite of heavy gunfire and bursting bombs during the sittings the hall was full all the time. A conference of nurses also roused great interest. No surgical journals appear in Leningrad now, but surgical literature is printed in pamphlet form.

"The experience of Leningrad has shown the great variety of responsibilities of surgeons in civilian hospitals. In spite of the very reduced number of surgeons the whole population was efficiently looked after, as everybody worked with redoubled energy. The second winter in the besieged city does not cause any anxiety to the surgeons of Leningrad. The atrocious conditions of work during the last winter will not recur. The hospitals are now adapted for winter work; they have enough wood for heating purposes, there is a better assortment of drugs and dressing materials. The surgeons will be able to give their help to the population remaining in Leningrad more confidently, because they know that the Red Army will not allow the enemy to enter the town. The Soviet Union is proud of the defenders of Leningrad." (Original Article.)

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Koster, H., and Kasman, L. P.: The Relation of Serum Protein to Well Healed and to Disrupted Wounds. *Arch. Surg.*, 1942, 45: 776.

This study includes data on total serum protein concentration in 1,358 consecutive admissions to a

surgical service, and a comparison of serum protein levels in 40 cases of wound disruption with those in 40 cases of well healed wounds. In the series of 1,358 patients there were 4 with wound disruption, in all of whom the serum protein was relatively high, ranging from 6.3 to 7.3. There were 87 with a range of serum protein concentration between 4.8 and 6.0, in none of whom disruption occurred. This seems to emphasize the opinion that the occurrence of normal concentrations of serum protein and albumin in some patients whose abdominal wounds have disrupted, and the occurrence of relatively low concentrations in many with well healed wounds mean that hypoproteinemia by itself is neither a necessary nor a sufficient condition for the development of wound disruption.

In the series of 40 cases with wound disruption the mean values for total protein and the albumin fraction were lower than in the series of cases with normal wounds, the mean values of serum protein being 6.19 and 6.76, and of albumin 3.26 and 4.21, respectively. Applying a mathematical probability formula to the data, the authors confirm their previous observation that the fall in total proteins found in patients with disrupted wounds is due entirely to the loss of albumin, and they suggest that a more accurate picture of protein disturbance can be obtained if the albumin fraction as well as the total serum protein is determined. They conclude that the poor nutritional state of which hypoproteinemia is a manifestation may favor wound disruption more than the serum protein level itself.

JOHN L. LINDQUIST, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Rothman, M., Tamerin, J., and Bullowa, J. G. M.: The Treatment of Burns. *J. Am. M. Ass.*, 1942, 120: 803.

The authors report the use of 2.5 per cent sulfadiazine in 8 per cent ethanolamine solution, a modification of the method of Pickerell, to provide rapid eschar formation and desiccation of the exuded serum in the treatment of severe burns.

The patients are treated with the usual shock therapy and surgical asepsis is maintained during handling. Morphine is the only anesthetic used. A light cradle is used to maintain a body temperature of 90°F. after spraying. The spray is used daily until an eschar forms, usually in from twenty-four to thirty-six hours and seldom later than the fourth day. The solution forms a thin pliable translucent eschar. If infection forms under it, collections of pus can readily be seen and a window is cut for drainage. The solution can be used about the face without danger to the eyes, and about joints without causing limitation of motion. It does not crack but begins to separate around the margins about the twelfth day. Dressings wet with the solution are placed at the margins to prevent infection of exposed surfaces.

The authors treated 32 patients suffering with burns involving from 10 to 45 per cent of the body surface with only 2 deaths. These patients died in secondary shock in the first forty-eight hours after injury.

MARIAN BARNES, M.D.

Gurd, F. B., Ackman, D., Gerrie, J. W., and Pritchard, J. E.: A Practical Concept for the Treatment of Major and Minor Burns. *Ann. Surg.*, 1942, 116: 641.

Because of the enormous increase in burned persons, and the likelihood of a further increase in the incidence of burns in the present conflict, the authors outline a method of treatment which in their hands has proved satisfactory, simple, and safe. It is of the utmost importance to have a plan of treatment for major burns worked out in detail in regard to personnel, equipment, and supplies. It is advantageous to have separate burn and shock teams so that the work of each may be carried on simultaneously. Supplies include stored plasma or serum, tannic acid, silver nitrate, 5 per cent sulfathiazole emulsion, and 4 in. by 6 in. cuts of 1 to 2 mm. curtain mesh.

The authors emphasize timing in burns, and time the plan to anticipate each of the problems commonly met with in turn, namely: (1) shock, during the first twenty-four to forty-eight hours, (2) toxemia from the second to the fifth day, (3) sepsis during the subsequent week or ten days, and (4) scarring and contractures. On admission of major burns, the following plan is put into action:

The patient is placed in the burn tent and the temperature gradually raised to 80° F. The shock team functions first, estimating the hemoconcentration and immediately administering plasma diluted 50 per cent by saline solution. A venous cannula is used routinely, rather than a needle.

Morphine (¼ gr.) is administered immediately and repeated during the first hour if necessary. For large surfaces of the trunk or thigh, tannic acid and silver-nitrate eschar is used. In all critical areas and for all minor and moderate areas, a thick pressure-type dressing is used. A mask is used for the face. For the critical areas and the face a basic dressing of 5 per cent sulfathiazole oil in water emulsion has been found to be highly effective in preventing and controlling infection. This emulsion is known as the M.G.H. formula and consists of:

Sulfathiazole (finely powdered)	5 per cent
Triethanolamine	2 per cent
Distilled water	24 per cent
White beeswax	5 per cent
Liquid paraffin	64 per cent

The initial dressing of the "sulfa-mesh" strips may be left after débridement for a week or longer with little odor and no discomfort. This dressing permits early skin grafting in deep burns. The M.G.H. emulsion gives a surprisingly high concentration of sulfathiazole locally, 120 mgm.+ in twenty-four hours, while blood levels are low. The sulfathiazole has a molecular solubility 800 times greater in the emulsion than in water, due, by inference, to the included triethanolamine. Thus, the

sulfathazole in solution represents approximately 26 per cent of the total sulfathiazole present in the emulsion. Moreover, there is an anesthetic action present which is due to the sulfonamide.

The nine steps as described by the authors in their plan of burn treatment are:

1. Treat shock.
2. Cleanse burn area with soapsuds with aseptic technique and without anesthesia.
3. Wash with saline solution.
4. Apply a single layer of 4 in. by 6 in. "sulfa-mesh strips." Individualize fingers. Mask is used for the face.
5. Over this apply ordinary gauze dressings impregnated with emulsion.
6. Place pressure dressings of cotton waste.
7. Wrap in sterile towels.
8. Bandage firmly with flannel bandages cut on the bias.
9. Add plaster-molded splints to hand, forearm, or where needed.

Finally, the authors make certain general observations concerning the pathology of burns and certain statements in relation to skin grafting. The organization of granulation tissue into scar results in contractures and a poor functional surface. Epidermization of scar tissue produces the poor bearing surface of hyperkeratotic "scar skin" that binds, shortens, cracks, and peels under ordinary trauma. Excessive scar tissue underlying a skin graft robs it of much of its functional results. Infection inhibits epithelization and favors excess granulation tissue; hence, its control is of importance. Various skin biopsy photographs are shown to illustrate the states of healing of different degrees of burn, together with the histological picture resulting from treatment of infected burns with sulfathiazole emulsion.

LUTHER H. WOLFF, M.D.

Rhoads, J. E., Wolff, W. A., and Lee, W. E.: The Use of the Sulfonamides in the Local Treatment of Burns. *Pennsylvania M. J.*, 1942, 46: 13.

The authors report the results obtained with sulfonamides in the treatment of 40 cases of burns. In the majority of these cases routine treatment consisted of débridement of the area followed by the application of vaseline gauze which had been dusted with sulfonamide powder, and an outer dressing of gauze. Sulfanilamide, sulfathiazole, and sulfadiazine were used.

It is pointed out that the three principal causes of death in patients with burns are (1) secondary shock caused by the reduction in plasma volume, (2) toxemia, and (3) infection.

Although tanning prevents weeping from the surfaces, the authors do not believe that it prevents a severe loss of plasma from the circulation, nor that it prevents toxemia. They are of the opinion that its chief value lies in the protection it affords against infection during the period of shock and toxemia.

It is pointed out further that tanning may have adverse effects. Stray tanning fluid may destroy the few remaining islands of epithelial tissue in the burned area. The tanning surface on the hands and face may crack, and provide a portal of entry for infection; and if tanning has been done circumferentially about a limb it may induce ischemia and even gangrene.

In the experience of the authors with the method described, infection was diminished, and it was their impression that spontaneous epithelization was greater but that the necessity for skin grafting was not eliminated.

The only toxic result from the use of the sulfonamides was hyperpyrexia; however, the authors warn that the use of sulfonamides in the treatment of extensive burns should be approached with caution.

ROBERT D. MANSFIELD, M.D.

Hawking, F.: The Effect of Sulfonamide Preparations on Experimental Infected Wounds. *Lancet*, Lond., 1942, 243: 507.

Judging by reports from the Middle East Forces, sulfonamide dressing of a wound is inferior to excision. However, as the exigencies of war often render surgical operations impracticable, dressing the wounds with a semifluid sulfonamide preparation would be advantageous in restraining bacterial growth until more elaborate treatment is feasible. A study of this proposal was made, by using experimental wounds in rabbits.

It was found that the persistence of the sulfonamide in a wound could be prolonged by incorporating the drug in an oily medium or by using a less soluble form such as sulfathiazole or sulfapyridine. Therapeutically, the best results were obtained with a preparation of sulfathiazole microcrystals suspended in saline solution; from sulfanilamide better results were obtained with oil preparations.

Histologically undesirable tissue reactions were caused by the presence of oil in the wounds, but cotton-seed oil was less harmful than liquid paraffin or cod-liver oil. It would seem that the best preparation for clinical use would be the microcrystalline suspension of sulfathiazole, or, failing that, an aqueous preparation of sulfanilamide.

WALTER H. NADLER, M.D.

Hodgson, A. R., and Robinson, J. R.: The Absorption of Sulfanilamide Applied Locally; Blood Levels in 41 Cases. *Lancet*, Lond., 1942, 243: 392.

This report is the result of a study of toxic as well as therapeutic results of sulfanilamide applied in wounds. The work started because the authors observed that in some of their orthopedic patients toxic symptoms occurred in the first few postoperative days. These included anorexia, nausea or vomiting, cyanosis, depression, and prostration. The ward Sisters reported that many patients seemed more ill after the operation than those who underwent similar procedures before sulfanilamide was used. Emesis delayed to the second and third postoperative day was not considered to be due to the anesthetic. It was decided, therefore, to take blood from patients

treated with sulfanilamide to determine the concentrations reached. The degree of absorption of sulfanilamide has never been established heretofore, though many observers reported varying estimates. Blood concentrations in Hawkings' series (1941) were rarely greater than 1.5 mgm. per 100 cc.

In the authors' cases of traumatic wounds, including compound fractures, excision of the skin edges and devitalized tissue was followed by packing with a roughly measured quantity of sulfanilamide powder, worked into the crevices of the wound with the fingers. When possible, primary suture followed. If the wound had to be left open, vaseline gauze was used as an immediate dressing. The same drug was put in deep wounds, which were closed with deep catgut sutures; the skin edges were tightly opposed by a continuous thread suture, with the addition, when necessary, of a few tension sutures. When a tourniquet was used, it was not removed until the wound had been closed and a pressure dressing applied. When abscesses were opened, and the wound left open for drainage, the cavity was packed with the powder, and a vaseline gauze dressing applied. After this free use of sulfanilamide with some adventitious results as noted, an exact estimate of absorption seemed indicated. For this study, Werner's method was adopted as its chief merit is its simplicity, and in view of the relatively low standard of accuracy required and the limited time and facilities available, it was considered most suitable for the purpose.

In 41 cases of traumatic and surgical wounds sulfanilamide was applied locally. The concentrations of the drug in the blood were measured. They were usually about 1 mgm. per 100 cc. for each gram deposited in the wound.

In many cases local application alone will maintain an adequate therapeutic level in the blood, so that simultaneous oral administration is by no means always necessary. With some wounds caution is advised lest too much sulfanilamide be applied locally, and toxic effects result from free absorption.

MATHIAS J. SEIFERT, M.D.

Lindsey, D.: Sterilization of the Sulfonamides for Local Use. A Neglected Problem. *South. Surg.*, 1942, 11: 765.

The author surveyed the private hospitals of New Orleans and found that half of them neglected to supply in sterile form the sulfonamides that are intended for local use in the prophylaxis of infection. He states that the conception of many surgeons is that the sulfonamides sterilize themselves. This attitude is erroneous, for spores, especially, have been grown repeatedly from batches of the drugs not properly sterilized. In the literature even a case of tetanus has been reported, the infection being traced to contamination of the container holding the sulfonamide. It is emphasized, therefore, that only sterile powders be used in open wounds. Sterilization can be effected by dry heat at 120° C. for twenty minutes or by autoclaving at 15 pounds of pressure for the same period. EDWIN J. PULASKI, M.D.

Aynesworth, K. H.: Lactrodectus-Mactans (Black Widow Spider) Bite As a Surgical Problem. *South. Surg.*, 1942, 11: 788.

The incidence of bite from a black widow spider is likely to increase, because so many soldiers live in camps. Since the signs and symptoms of this bite so closely simulate those of acute surgical conditions of the abdomen, the importance of careful history taking cannot be overemphasized. Many needless operations may be prevented if surgeons can be impressed with this.

A careful study of the history of patients suffering from this poisoning shows that they were under the influence of some toxin which affected the entire neuromuscular system before the local manifestations of disease in the abdomen appeared. The abdominal symptoms are merely an expression of a general condition, rather than the reverse. Other phenomena in the general picture should aid in the diagnosis: the patient presents the symptoms of acute spinal irritation in the musculature of the body, including the respiratory muscles; in many patients, evidences of an acute disturbance of the sensorium appear, such as delirium and stupor. These are not the usual accompaniments of acute abdominal disease. The presence of these symptoms should arouse the suspicion of the examiner.

Two cases of poisoning from a black widow spider are reported, which stress the importance of obtaining a careful history of the case before the local abdominal symptoms appear. SAMUEL KAHN, M.D.

ANESTHESIA

Bird, C. E.: Aspiration of the Lower Air Passages Following Endotracheal Anesthesia. *J. Thorac. Surg.*, 1942, 12: 44.

In long difficult operations, and especially in thoracic and high abdominal surgery, the author advocates bronchoscopic aspiration to remove secretions in the bronchial tree. The advantages of immediate postoperative aspiration completed before recovery of the cough reflex are as follows:

1. The procedure prevents the descent of exudate into lobes and lobules.
2. It favors re-expansion of collapsed lobes when positive pressure is applied by mask and negative pressure is exerted within the pleural space.
3. It allows patients to lie horizontally instead of in the head-down position, thus conserving vital capacity.
4. It eliminates coughing, thus lessening circulatory strain and allowing the patient more complete rest.

In thoracic operations, bronchoscopic aspiration is done under local anesthesia immediately before the introduction of the endotracheal tube, and aspiration is used whenever needed throughout the surgery, a catheter with an open end and a side hole near the end being used. Then, at the close of the operation, the pharynx is sucked out and the trachea and bronchi are aspirated through the endotracheal tube.

The tube is withdrawn, the bronchoscope inserted, and every portion of the bronchial tree and trachea and larynx made perfectly clean and dry under direct vision. After the bronchoscope is removed, moderate positive pressure is applied as effectively as possible by mask and at the same time negative pressure is exerted in the pleural cavity, all lobes being expanded with air to the desired degree.

Whenever secretion reappears in the bronchial tree after operation, it should be removed. Unless it is coughed up quickly and completely, bronchoscopic aspiration should be carried out in the patient's room. In a few cases, if secretions reaccumulate rapidly, tracheotomy is indicated in order that aspiration may be repeated at short intervals with little disturbance.

Twenty-two cases are reported which form the basis for the views expressed. MARY KARP, M.D.

Thienes, C. H., and Greeley, P. O.: The Heart under Cyclopropane. *California West. M.*, 1942, 57: 188.

The authors found that cardiac arrhythmias under cyclopropane anesthesia are most marked at about apneic concentrations. Deepening the anesthesia with high concentrations (from 50 to 75 per cent) of cyclopropane in the breathing bag largely abolishes irregularities of the pulse and does not seem to increase the hazard to the patient. The indispensability of an intact hypothalmus for the production of the arrhythmias suggests that this structure, rather than the intrinsic cardiac tissue, is the site of the anesthetic agent in this regard.

EARL O. LATIMER, M.D.

Gaarde, F. W., Prickman, L. E., and Raszkowski, H. J.: Is the Asthmatic Patient a Good Surgical Risk? *J. Am. M. Ass.*, 1942, 120: 431.

A study was made of 189 consecutive cases of allergic asthma and asthmatic bronchitis in which major operations were performed at the Mayo Clinic between July, 1934, and September, 1940. The series consisted of 101 cases of predominantly allergic asthma and 88 cases of asthmatic bronchitis.

In considering postoperative complications, only pulmonary complications were included in this study. In 25 (13.2 per cent) of the 189 cases some form of pulmonary complication, including severe asthma, developed after operation. There were 10 cases of postoperative pneumonia (5.3 per cent), 9 of severe asthma (4.8 per cent), 3 of bronchitis (1.6 per cent), 2 of atelectasis (1.1 per cent), and 1 of pulmonary infarction (0.5 per cent).

The asthmatic patients in this series received special preoperative and postoperative consideration in an attempt to prevent postoperative pulmonary complications. All patients who had had recent colds were denied operation until they had completely recovered from the infection. Before being subjected to operation, patients with acute severe asthma were hospitalized preoperatively until the asthma was under better control.

The authors concluded that the risk of operation on patients who have asthma and asthmatic bronchitis and have received adequate preoperative and postoperative care is not great inasmuch as 86.7 per cent of their patients underwent major operations without the development of significant pulmonary complications. Patients with asthma and asthmatic bronchitis who undergo operations on the upper part of the abdomen, however, are more likely to have postoperative pulmonary complications, including exacerbations of severe asthma, than those who undergo operations on the lower part of the abdomen.

Koster, H.: Blood-Pressure Changes during Spinal Anesthesia in Nonoperative Cases. *Arch. Surg.*, 1942, 45: 596.

Koster studied the blood-pressure changes found after spinal anesthesia in human beings without the interfering factor of the operative procedure.

The blood pressure in patients not subjected to operation was studied before and during spinal anesthesia under three sets of conditions.

In the first group, 65 patients were studied for a control period of twenty minutes, systolic and diastolic blood-pressure readings being taken every two minutes; then 150 mgm. of procaine hydrochloride dissolved in 4 cc. of spinal fluid was injected, with the patient in the lateral prone position. Immediately after the injection the patient was placed in the dorsal position and the table tilted to an 8° or 10° Trendelenberg angle. Blood-pressure readings were immediately resumed at two-minute intervals and continued for another period of twenty minutes. (These patients were subsequently operated upon.)

In the second group, control blood-pressure levels were obtained in 4 patients; their lower extremities were then bandaged with elastic bandages from toes to groin to support and compress the venous system. New blood-pressure levels were obtained under spinal anesthesia induced as in Group I, and with the patients in the same position, the studies being continued as in the first group.

The third group comprised 6 patients, studied as in Group I, except that before the readings were begun and throughout the period of observation, the patients were kept in a 45° Trendelenberg position.

The author concludes as follows:

There is approximately the same percentage drop in the systolic and diastolic blood pressure during spinal anesthesia in patients not subjected to operation. This is in accord with what would be expected if decreased arteriolar constriction followed the induction of spinal anesthesia. The development of hypotension following the induction of spinal anesthesia in patients with the extremities supported by elastic bandages or in the extreme Trendelenberg position is evidence that venodilatation is not the causative factor of the blood-pressure fall. The decreased pulse pressure indicates a decrease in cardiac output. Decreased cardiac output is a factor, but probably not the only one responsible for the hypotension of spinal anesthesia. J. M. MORA, M.D.

Smirk, F. H., and McGeorge, M.: S-Methylisothiourea Sulfate for Maintaining Blood Pressure in Spinal Anesthesia. *Lancet*, Lond., 1942, 243: 301.

A new pressor substance, S-methylisothiourea sulfate, has recently been introduced, and its effect on the blood pressure during spinal anesthesia has now been tried. It has been shown that when injected intravenously in anesthetized, decerebrated, and pithed animals, this substance produced a substantial and prolonged rise in the blood pressure, accompanied usually by some slowing of the heart. The blood pressure rise was still obtained when the motor nerve endings of the sympathetic had been blocked by ergotoxine or by 1.3 methyl piperidinobenzodioxan. The substance caused contraction of isolated strips of smooth muscle from the intestine, bladder, and uterus. The effect on the intestine was diminished, but was not abolished by atropinization.

It seemed, therefore, that the substance stimulated organs containing smooth muscle by a peripheral action, and there was some evidence to suggest that the effect was directly on muscle. It appeared likely that S-methylisothiourea sulfate might prove of value in the treatment of shock unaccompanied by severe reduction of the blood volume. In severe surgical shock, experimentally produced, the substance raised the blood pressure and improved the condition of the animals.

In 20 cases in which S-methylisothiourea sulfate was employed, the blood pressure was raised. In some instances it rose by as much as 65 mm. of mercury, and in 18 cases it rose 20 mm. or more.

SAMUEL KAHN, M.D.

Bishop, H. F., and Rudder, F. F.: Intravenous Anesthesia. *J. Am. M. Ass.*, 1942, 120: 807.

The authors have administered intravenous anesthesia to 1,157 patients over a period of four years (1,136 patients received pentothal sodium and 21 received evipal soluble). They believe that fatalities and serious complications with this type of anesthesia can be ascribed to an injudicious choice of anesthetic, or to overdosage. Intravenous anesthesia alone was not relied upon for major surgical procedures, but was used in combination with topical, spinal, and block anesthesia. Except for induction, it has not frequently been used with inhalation anesthesia.

The indications for intravenous anesthesia have been divided into 6 main divisions:

1. Minor short operative procedures
2. In combination with other types of anesthesia
3. Diagnostic procedures
4. Procedures utilizing electrical apparatus
5. Eye surgery
6. Control of convulsive states

In patients who have recently ingested food, the danger of vomiting is minimized by intravenous anesthesia. This type of anesthesia is especially applicable for the control of nausea and retching associated with spinal anesthesia; it is valuable for the induction of anesthesia in patients who are unduly apprehensive; it is preferred in cystoscopy and encephalography; combined with thorough cocainization of the pharynx and larynx, it is probably as good as any other means of providing general anesthesia for bronchoscopy and esophagoscopy; and it provides a noncombustible general anesthesia in cases in which it is necessary to use electrical equipment.

The authors have made it their practice to restrict the use of intravenous anesthesia in the following conditions: (1) if the patient is under fifteen years of age; (2) if there is inflammation about the mouth and throat with potential encroachment on the upper respiratory tract; (3) if there is reduced vital capacity; (4) if advanced liver or kidney disease is present; (4) in the presence of shock, hemorrhage, or anemia; (6) in severe diabetes; (7) if the operation involves the skin primarily; and (8) if the patient is ambulatory.

The equipment necessary for the administration of intravenous anesthesia is discussed.

The authors stress the importance of adequate premedication preferably with a morphine-scopolamine combination. Cocainization of the pharynx and larynx prior to the introduction of the anesthetic into the airways is considered worth while.

In the experience of the authors, the intravenous administration of pentothal sodium for operations about the eyeball produced bradycardia. Other reactions such as retching, coughing, or sneezing sometimes occurred, though rarely.

The mechanism of respiratory failure under intravenous barbiturates is discussed. The authors describe 1 case of apnea, in a patient with advanced pulmonary tuberculosis, which lasted for forty-five minutes and did not respond to oxygen administered under pressure.

MARIAN BARNES, M.D.

Crossman, L. W., Hurley, F. M., Hurley, V., Ruggiero, W., and Warden, C. E.: Refrigeration Anesthesia. *Current Res. Anesth.*, 1942, 21: 241.

Experiments on the influence of reduced temperature which have been described should allay fears concerning the few hours of tourniquet application and chilling required for operative anesthesia. This experimental assurance has been fulfilled in the clinical experience concerning the harmlessness of the method. Recently the observed benefits could be enumerated as follows: ease and quickness of operation, absence of pain both before and afterward, inhibition of infection, conservation of poorly nourished tissues, control of edema, promotion of drainage when necessary, probable reduction of thrombotic and embolic dangers, and pre-eminently the avoidance of shock. To these may apparently be added the prevention of postoperative gastrointestinal troubles.

Of greatest importance from the anesthetic standpoint is the introduction of an entirely new principle, namely anesthesia of protoplasm, in contrast to all former methods which produce only anesthesia of

nerves. The nonreactivity and nonformation of chemical toxins in tissues thus anesthetized may be considered largely responsible for the mitigation of local damage, preservation of local vitality, and, apparently, absence of systemic shock when the method is properly employed. How far this principle can be extended beyond the field of limb surgery is a problem for future investigation.

As a preoperative, palliative, or conservative treatment, intensive refrigeration without a tourniquet can often radically check pain, infection, and tissue necrosis. Such use was illustrated by McElvenny in a traumatic case. Temple Fay was the pioneer in radical chilling without a tourniquet, and he describes dramatic control of infections, including gas gangrene. As pointed out in a discussion elsewhere, the skin-patch tests of Brooks and Duncan in animals do not militate against the proper employment of either hot or cold, and they also do not duplicate the conditions of arteriosclerotic gangrene. There might be a theoretical hope of healing this form of gangrene by the arrest of infection and reduction of the local metabolism to correspond to the scanty blood supply. The reduced temperature, however, also retards all tissue activities including healing. In the authors' series, no limb that could not otherwise be saved has been saved by cold. This result is on a par with the apparent failure of all other artificial methods, because the saving of a hopelessly arteriosclerotic limb is possible only by some method of permanently increasing the blood supply. J. M. MORA, M.D.

Adriani, J.: Rebreathing in Anesthesia. *South. M. J.*, 1942, 35: 798.

Irrespective of the technique employed in inhalation anesthesia, there is some rebreathing of exhaled gases. Carbon dioxide may accumulate and cause physiological disturbances. If rebreathing is not carefully controlled, oxygen tension may be lowered below the physiological need, or excessive resistance to inspiration or expiration, or both, may be introduced.

To offset these difficulties, completely closed systems have been designed for total rebreathing, the carbon dioxide being removed by chemical absorption. Alkalies are the best absorbants for carbon dioxide, soda lime being the most popular because of its efficiency, cheapness, and convenience in handling.

Regardless of the fact that numerous models of apparatus are manufactured, two general types of rebreathing units are known. The "circle filter" consists of a cannister to contain the absorbant, with valves interposed at the outlets. These valves allow only a unidirectional flow of the gases over the absorbant and contact only once. The "to-and-fro" type consists of a mask, rebreathing bag, and cannister. Here gas is passed from the mask through the cannister to the bag on expiration, and back over the absorbant on inspiration.

The advantages and disadvantages of the two types are discussed by the author in detail, and emphasis is placed on the resistant factor in the two machines. Resistance to respiration, if excessive, particularly that to the inspiratory phase, is believed to favor the onset of pulmonary edema; the pulmonary capillaries constrict during inspiration and cause a back pressure to develop in the venous circulation through the lungs and a transudation of fluid occurs from these vessels.

Cross infection from one infected patient to another with anesthesia apparatus is not a remote possibility. This danger may be completely eliminated by cleaning of the tubing, masks, and connecting pieces thoroughly after use. The cannister containing absorbant is not easily cleaned. However, in the laboratory as well as clinically, bacteriological studies have shown that there is no transmission of bacteria from the cannisters heavily infected with colon, tubercle, and other bacilli. The highly caustic chemical and the heating during absorption possibly have a germicidal effect. STEPHEN A. ZIEMAN, M.D.

Johnson, C. R., and Mann, F. C.: The Effect of Anesthetics on Gastric Tonus and Motility, with Special Reference to Acute Gastric Dilatation. *Surgery*, 1942, 12: 599.

The authors asked: "Why does the stomach become atonic in the first place and in some cases remain so for a considerable length of time, even in spite of treatment?" Clinically, they said that acute gastric dilatation has been observed following an attack of migraine, during the course of pulmonary tuberculosis, in severe diabetes, and following various operative procedures. In the majority of cases, however, the condition has occurred postoperatively, and in these cases it has occurred most frequently following laparotomy in patients who have had a general anesthetic. Hence, the authors thought it only natural to look to the effects on the stomach incident to operation, either the operative procedure itself or the anesthetic, or both, in seeking an explanation of this complication.

They studied the effects of anesthetics on the motor activity of the stomach in dogs that had permanent gastric fistulas. Young healthy dogs weighing from 7 to 16 kgm. were selected and trained to lie quietly on the right side. The Mann-bollman type of fistula was employed.

The apparatus used to record the motor activity of the stomach was the balloon-bromoform manometer apparatus similar to that described by Carlson. A deflated condom balloon attached to the end of a No. 20 French hard rubber catheter was passed through the fistula into the stomach. The other end of the catheter was attached to a rubber tube connected with the manometer. One hundred and eighty cubic centimeters of air were introduced into the balloon; this amounted to a pressure of from 2 to 6 cm. of bromoform. The volume was not sufficient to stretch the walls of the balloon. A writing lever attached to a float riding on the column of bromoform recorded the activity of the stomach on a slowly revolving kymograph. Because this method records changes of diaphragmatic pressure.

a concomitant record of the respiratory excursions was made by a standard pneumographic method.

The animals were fasted for from eighteen to twenty-four hours preceding each experiment. A control observation of from fifteen to thirty minutes was made before each anesthetic was given. Observations were not made during the periods of induction of, nor reactions from, the anesthetics because during these periods exaggerated respiratory excursions and bodily movements made recording of gastric motor activity impossible. Observations were made at various intervals after the administration of the anesthetics had been discontinued until gastric tonus and motility had returned to the control level.

The anesthetic gases were administered by means of an apparatus which allows rebreathing of the gases and which was designed by Mousel and Seldon for use on laboratory animals. Carbon dioxide was absorbed from the exhaled gases by means of soda lime. This apparatus was attached to a standard clinical gas machine.

Observations of the effects of anesthetics on gastric tonus and motility were repeated after splanchnicectomy and vagotomy. For this denervation a two-stage procedure was employed. When recovery was complete, usually after two or three weeks, splanchnicectomy was performed through the eighth interspace on the right side in a manner identical with that employed on the left. Bilateral splanchnicectomy and double vagotomy were performed on 4 dogs by this two-stage procedure.

The effect of ether anesthesia on gastric tonus and motility was studied in 12 dogs. Induction of anesthesia was carried out by the open-drop method. Anesthesia was carried to Plane 2 of the third stage, according to the criteria of Guedel, and maintained as nearly as possible at that level for fifteen minutes. In every instance gastric tonus was greatly diminished and motility completely abolished. The time required for tonus and motility to return to normal was from one hour and fifteen minutes to ten hours. In 8 dogs the motor activity had returned to normal from two to three hours after the anesthetic was discontinued. Usually tonus began to return before motility; otherwise tonus and motility returned together.

Effects of ether anesthesia with premedication with morphine and atropine also were studied. Morphine sulfate in doses of from 0.5 to 0.75 mgm. per kilogram of body weight and atropine sulfate in a dose of 0.023 mgm. per kgm. of body weight were given hypodermically. Morphine in this dosage produced a state of drowsiness in the dog which was thought comparable to that produced in man following the usual preoperative administration of morphine.

In all observations after the administration of morphine there was a transient increase in gastric tonus and motility followed by a marked decrease in motility and a moderate reduction in tonus. There was little further effect on gastric activity after the administration of atropine. After etherization to the third stage there were a further decrease in tonus and complete loss of motility. The average time required for tonus and motility to return to normal was five hours and fifteen minutes.

Effects of nitrous oxide-oxygen and ether anesthesia likewise were studied. For these experiments an ether vaporizer was attached to the gas machine. With nitrous oxide-oxygen the animals were anesthetized as deeply as possible without the production of cyanosis. Ether was then added and the degree of anesthesia was carried as nearly as possible to Plane 2 of the third stage and held there for fifteen minutes. Very little skeletal muscular relaxation was produced by the gas-oxygen alone and during this period gastric motor activity was unaffected. After ether was added and anesthesia carried to the third stage, there was marked reduction in the gastric tonus, and the motility was entirely abolished. The time required for the tonus and motility to return to normal fell within the range of that which was required for ether alone.

Ether anesthesia supplemental to a basal anesthetic of avertin with amylene hydrate was studied. Avertin with amylene hydrate in a dose of 100 mgm. per kilogram of body weight was administered thirty minutes before ether was given. In 2 dogs the amplitude of contractions was moderately reduced. In all instances, after anesthesia was carried to the third stage with ether, the effect on gastric tonus and motility was the same as that produced with ether alone.

The effect of prolonging ether anesthesia on gastric motor activity was studied. Third-stage ether anesthesia was maintained for one hour and fifteen minutes. The results were very similar to those obtained with the fifteen-minute period of ether anesthesia. The time required for tonus and motility to return to normal averaged ten minutes longer than that required when ether anesthesia was maintained for only fifteen minutes.

The effect of cyclopropane-oxygen anesthesia on gastric motor activity was studied. Anesthesia was carried to Plane 2 of the third stage and maintained at the level for fifteen minutes. Skeletal muscular relaxation was thought to be as complete as that observed with ether. The effect on gastric motor activity was strikingly similar to that of ether. Gastric tonus was greatly diminished and motility entirely abolished. The average time required for motor activity to return to normal in all observations was two hours and forty-five minutes.

Cyclopropane-oxygen anesthesia supplemental to a basal anesthetic of avertin with amylene hydrate was studied. The effect of cyclopropane-oxygen on gastric tonus and motility was not altered when these agents were supplemental to a basal anesthetic of avertin with amylene hydrate in a dose of 100 mgm. per kilogram of body weight.

The effect of nitrous oxide-oxygen was studied. Anesthesia carried as deeply as possible with nitrous oxide-oxygen without the production of cyanosis did

not affect gastric tonus or motility. In these instances there was very little skeletal muscular relaxation.

A depth of anesthesia sufficient to produce skeletal muscular relaxation was always accompanied by cyanosis. In these observations the effects on gastric tonus and motility were very similar to those obtained with ether.

The effect of ethylene-oxygen on gastric motor activity was studied. In these observations there was little effect on gastric tonus and motility.

Pentothal sodium in a 5 per cent aqueous solution was administered intravenously. Anesthesia was carried to the third stage according to the criteria of Lundy. From 23 to 28 mgm. of pentothal sodium per kilogram of body weight was required.

In all of these observations the tonus and motility had returned to normal before the animal was awake.

The effect on gastric motor activity of the intravenous administration of pentothal sodium supplemented with nitrous oxide-oxygen was studied. Pentothal sodium in doses of from 15 to 20 mgm. per kilogram of body weight was given intravenously and the animals were allowed to breathe a gas mixture composed of equal parts of nitrous oxide and oxygen. In all observations there was no effect on the gastric tonus or motility.

Observations as to the effects of spinal anesthesia were made. A 2.5 per cent solution of procaine hydrochloride in doses of from 3.3 to 6.8 mgm. per kilogram of body weight was used. Injection of anesthetic solution was done between the spines of the last thoracic and first lumbar, or of the first and second lumbar vertebrae. The criteria used to determine a successful experiment were the free aspiration of spinal fluid before and after the injection, complete paralysis of the hind legs, and the demonstration of a sensory loss at the upper thoracic level. Gastric tonus and motility returned to normal about the time the first movements of the hind legs were noted.

The effect of the anesthetics used in the innervated group of animals was studied in 4 dogs on which bilateral splanchnicectomy and double vagotomy had been performed, in 2 dogs on which bilateral splanchnicectomy only had been performed, and in 2 dogs on which double vagotomy only had been performed. In all three of these groups of denervated animals the effect of anesthetics on gastric tonus and motility was essentially the same as observed in the innervated group of animals.

It can be seen that anesthetics had either a depressing effect on the gastric tonus and motility or no effect at all. The decrease in activity was in a general way directly proportional to the degree of anesthesia produced, regardless of the agent used. Anesthesia carried to Plane 2 of the third stage by any of the inhalation anesthetics, whether employed alone, in combination with another inhalation anesthetic, or supplemental to a basal anesthetic of avertin with amylene hydrate, caused a marked reduction in the gastric tonus and complete cessation of motility. Since the effect of these anesthetics in the three groups of denervated animals was essentially the same as in the innervated group, it was concluded that the effect was primarily on the peripheral gastric motor mechanism and was not mediated through the splanchnic or vagus nerves.

There was very little evidence to indicate that the decrease in gastric tonus and motility was dependent on the relative quantity of oxygen in the blood and tissues during anesthesia. It is true that with nitrous oxide-oxygen, in order to anesthetize the dog deeply enough to permit satisfactory observation, it was necessary to increase the concentration of nitrous oxide to the point of cyanosis. Just what effects were due to anoxia and what effects were due to the concentration of nitrous oxide in the blood it is impossible to say. Cyclopropane-oxygen anesthesia depressed gastric motor activity much more than did ethylene-oxygen anesthesia, even when some cyanosis was produced with the latter agent.

Apparently the depth is more important than the duration of anesthesia in relation to the effects on gastric tonus and motility. Increasing the duration of ether anesthesia fivefold prolonged the depressing effect very little.

The authors have no explanation for the decrease in gastric motor activity which was observed during spinal anesthesia. Before their work was undertaken they thought that this method would cause an increase in activity similar to its reported effect on the small intestine. The explanation given for the increase in activity in the small bowel during spinal anesthesia is that the inhibitory influence mediated through the splanchnic nerves is abolished by the blocking of conduction through these nerves with procaine.

The fact that the same decrease in gastric activity during spinal anesthesia was observed after splanchnicectomy led to a consideration of some other mechanism not dependent on the presence of the splanchnic nerves to account for this effect. The possibility that procaine circulating through the blood stream might effect the peripheral gastric motor mechanism directly was considered, but the injection of large amounts of procaine in the region of the spinal cord but not in the subarachnoid space failed to decrease the gastric tonus and motility. What effect a lowering of the blood pressure due to spinal anesthesia would have is not known. There is the possibility that the decrease in gastric activity might be dependent on the effect of spinal anesthesia on the small bowel. It has been shown, for instance, that handling of the small bowel causes a decrease of gastric motor activity whether the splanchnic nerves are intact or not.

Premedication with morphine and atropine definitely prolonged the depressing effect produced by ether.

If the same situation obtains in man as was found in the dog, it may be seen that considerable gastric atony may follow deep general anesthesia, presumably by a direct effect on the peripheral gastric motor

mechanism. This should take on more significance if it is true that the human gastric motor mechanism is depressed more by anesthesia than that of the dog and if the same individual susceptibility to anesthesia prevails in man as was observed in the dog. It may be that if block anesthesia of peripheral nerves were employed in conjunction with a lesser degree of general anesthesia there would be less postoperative gastric atony attributable to the effect of anesthetic agents.

If comparatively little gastric atony were found to develop postoperatively among patients who had had pentothal-sodium nitrous oxide-oxygen alone, or ethylene-oxygen alone, it might be argued, on the basis of the results of this investigation, that this was because these agents do not depress gastric motor activity to any great extent. While this might be true in part, it does not tell the whole story. By virtue of the scope of operation permitted under these agents, the operative trauma is different from the trauma in those procedures requiring complete muscular relaxation. Certainly the extent of trauma would be less in most cases.

There is probably some gastric atony after every operative procedure, but the occurrence of the more advanced stages of acute dilatation of the stomach appears to be infrequent at the present time. Aside from any change in the etiological factors in acute gastric dilatation, the lessened incidence of the condition would seem to be due in a large measure to better postoperative care. The aspiration of the collected fluid and gas from the stomach, and the more general application of the principle of continuous gastric aspiration as advocated by Paine and Wangensteen, together with the replacement of lost fluid and electrolytes probably have had much to do with the lessened incidence of this grave postoperative complication.

SURGICAL INSTRUMENTS AND APPARATUS

Clock, R. O.: The Sterility of American-Made Surgical Catgut Sutures; A Twelve-Year Study. *Am. J. Surg.*, 1942, 58: 229.

Fourteen different brands of American-made surgical catgut sutures were included in a twelve-year survey of the sterility of surgical catgut. This study comprised 1,381 lots in which there were 17,386 catgut sutures. An improved bacteriological method of investigation with certain additional procedures and modifications has been adopted by the United States Pharmacopia XI as the standard technique for tests for the sterility of solids. This became official on January 1, 1941, and is now being enforced by the Federal Food and Drug Administration.

It has been found from long and continued study that chemical methods of sterilization are insufficient. In some instances chemical sterilization is still used but has been supplemented with the use of adequate heat. Sutures which were found to be nonsterile repeatedly over a period of several years are no longer manufactured. The sutures of one manufacturer exhibited a degree of unreliability which was dangerous.

During the past seven years there has been a progressive improvement in the status of the sterility of the American catgut sutures. Among eight brands of American-made surgical catgut sutures that were continuously manufactured and sold on the open market during this period of twelve consecutive years, only five were found to be uniformly sterile every year and therefore safe to use. No brand names or names of manufacturers are used. A simplified table shows the percentage of nonsterile lots of catgut sutures of the fourteen American brands, from 1930 to 1941, inclusive.

RICHARD J. BENNETT, JR., M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Lowman, R. M., and Finkelstein, A.: Air Myelography for Demonstration of the Cervical Spinal Cord. *Radiology*, 1942, 39: 700.

Presence of air in the upper cervical region following encephalography and ventriculography has been reported in the past by previous investigators. However, there have been no studies found in the literature of the normal roentgen anatomy of the cervical cord. Normal roentgen measurements of the cervical cord following air injection into the lumbar subarachnoid spinal pathway were determined by upright lateral and occasionally oblique roentgenograms of the cervical area (Fig. 1).

Fifty unselected encephalograms were reviewed and in all cases air was demonstrable in the cervical region. In the erect position air is retained in the cervical area following lumbar injection. It is believed that the downward projection of the cerebellar tonsils through the foramen magnum has a tendency to block the passage of air into the intracranial cavities.

The cervical vertebral canal presents a greater transverse than sagittal diameter. The transverse diameter of the cord is greatest at the level of the fifth and sixth cervical vertebrae. This is due to the increased number of afferent and efferent neurons from the brachial and cervical plexuses. The lower margin of the foramen magnum and superior borders of the posterior arch of the atlas constitute the upper limit of the cervical spinal cord.

Normal sagittal cervical-cord measurements were determined by studying 80 encephalograms and the cervical region following pneumomyelography in 30 individuals. The average measurements were: cervical I to III, inclusive, 1 mm.; cervical IV, 0.95 mm.; and cervical V to VII, 0.9 mm. These studies are being continued. In addition laminographic studies are being done.

The curvature and length of the cervical spine vary. Usually there is a slight curve of the upper cervical spine with the convexity anteriorly. The upper portion is funnel-shaped to the level of cervical III, and from cervical III to thoracic I the lumen remains the same.

Tumors may produce enlargement and deformity of the cord. Syringomyelia results in a fusiform enlargement. The authors are of the opinion that air myelography enables the demonstration of cervical cord lesions before the occurrence of bone changes. Two cases with surgical confirmation are reported.

MAURICE D. SACHS, M.D.

Clute, H. M., and Lawrence, K. B.: Cholangiographic Artifacts Resembling Common-Duct Stones. *N. England J. M.*, 1942, 227: 727.

Because of the fact that stones may be left in the common duct after operation and give no clinical evidence of their presence in the course of the usual postoperative procedures when T tubes are left *in situ* for drainage, roentgenological visualization of the common bile duct by the injection of a radiopaque substance through the T tube has been

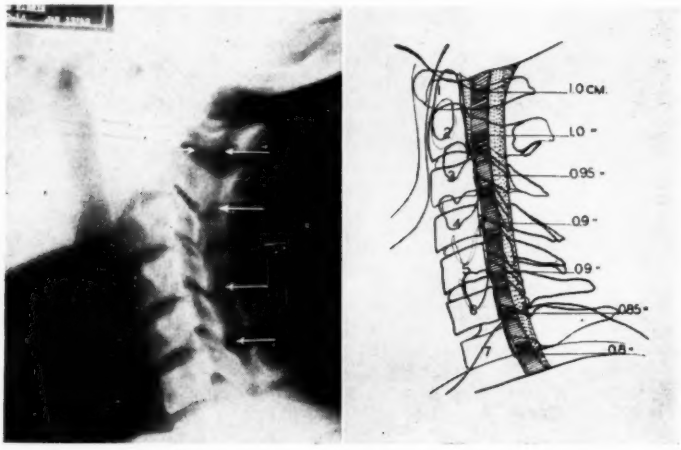

Fig. 1. Normal myelogram of the cervical area. The posterior limits of the cord are indicated by arrows. The accompanying diagrammatic tracing shows the average normal measurements for the respective cervical levels.

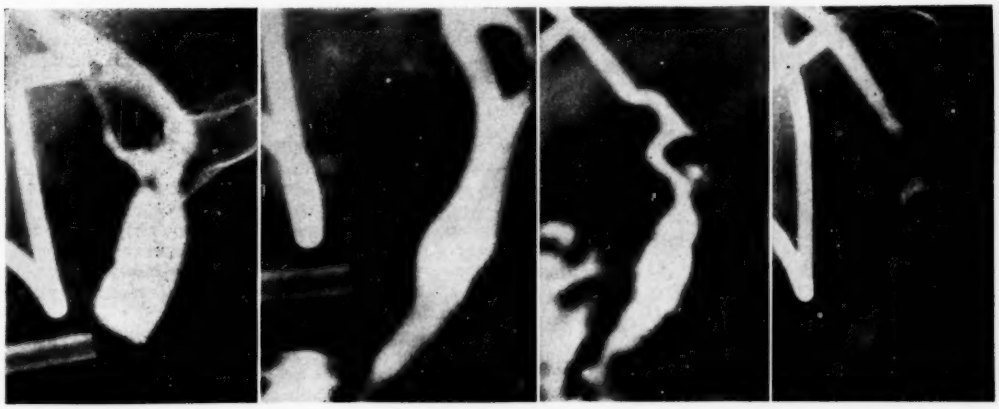

Fig. 1. Case 1. Cholangiograms on various days. This patient had a postoperative blood clot in the common duct. Note the variations in the shapes of the filling defect from day to day, with no change in its relation to the end of the T tube. There is a long streak-like defect in the first film, which probably represents a mucous streamer from the clot. Note the reduction in the size of the defect.

developed in recent years as a means of gaining further objective information regarding the patency of the duct. These postoperative cholangiograms have proved highly valuable and the authors routinely use them on their service before removing the tube. Normally this procedure permits of demonstrating the ducts with the absence of constant filling defects and free passage into the duodenum. Dilatation of the biliary-duct system, the presence of a foreign body which produces persistent positive or negative shadows, and a lack of patency may be ascertained in this manner.

In 4 recent postoperative cholangiograms, however, the authors found a filling defect in the common duct close to the lower end of the T tube; it was suggestive of a residual stone but on further study in each case, it was found to be an artifact. In none of these cases had stones been present in the duct at operation. This fact first aroused suspicion that the roentgen shadow might be due to something other

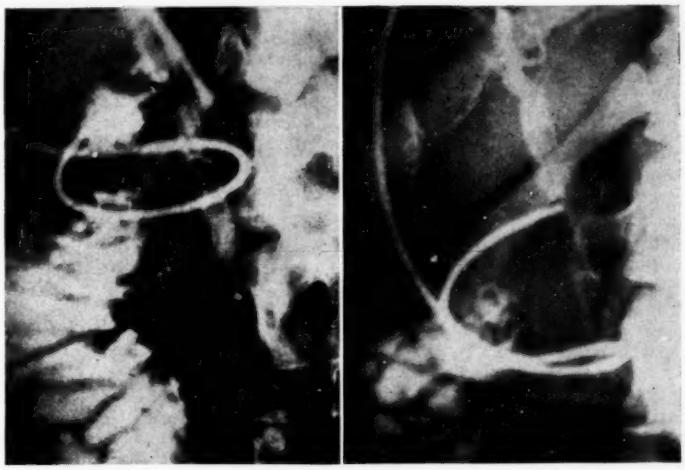

Fig. 2. Case 2. Cholangiograms. The air bubbles in these films resemble common-duct stones. Note the air around the arms of the tube, the changing size and symmetry of the bubbles, and the rapid and ready emptying of lipiodol into the duodenum.

than stone. Further investigation revealed a clot of old blood, bile, and mucus clinging to the lower end of the T tube to be the cause of the filling defect in 3 cases, as demonstrated on removal of the tubes. This was confirmed by the smooth recovery of the patients. In 1 of these cases, repeated cholangiograms demonstrated a diminution in the size of the filling defect over several days, probably as a result of the mechanical irrigation of the tube. The clot did not obstruct the flow of bile in any of the cases, and colic was not produced.

Study of the cholangiograms of these cases showed the following findings to be of value in differentiating such partial obstructions from stones or other solid foreign bodies in the common duct: the filling defect appeared in direct, or nearly direct, contact with the lower end of the T tube; the defect changed in shape in serial roentgenograms because of the malleability of the soft clot by action of the bile current, of the injected radiopaque medium, or of the local duct contraction or relaxation; streaklike defects extending from the principal filling defect several centimeters distally in the duct (this appearance was probably produced by streamers attached to the main clot and required close examination); and irrigation through the T tube and the injection of the opaque medium apparently washed part or all of the clot from its attachment to the tube, and thus changed the appearance of the filling defect in subsequent films.

A typical case illustrating such findings is reported in detail. Consideration is also given to the fact that air bubbles present in the common duct may simulate a smooth oval residual stone, and one case in which this was true is cited and illustrated by roentgenograms. These cases can usually be differentiated by the fact that the shadows change in size and shape on serial films, and also because of the evidence of air around the arms of the T tube.

ADOLPH HARTUNG, M.D.

Attwood, C. J., and Sargent, W. H.: Cystic Fibrosis of the Pancreas with Observations on the Roentgen Appearance of the Associated Pulmonary Lesions. *Radiology*, 1942, 39: 417.

Cystic fibrosis of the pancreas is not very uncommon although its diagnosis in the living is unusual. It may even be missed at autopsy if sections of the pancreas are not taken for microscopic study. The etiology of the changes in the pancreas has not been definitely established. The associated pathological changes in the lungs may overshadow the fundamental pathological process in the pancreas.

The roentgen appearance of the pulmonary lesion is that of purulent bronchitis with bronchiectasis, bronchiectatic abscess formation, and surrounding pneumonitis. These changes may, of course, occur in patients who are not suffering from pancreatic disease. The authors state that 6 features may suggest the presence of associated disease of the pancreas; they are as follows:

1. In the typical case of cystic fibrosis of the pancreas the pulmonary changes are diffuse, as they involve all of the lobes of both lungs but most marked by the region around the hilum. The hilar shadows are increased in density, with loss of definition, and extend outward into a surrounding mottling which gradually diminishes toward the periphery of the lung.

2. The marked chronicity of the pulmonary lesion is a striking feature and may lead to an erroneous diagnosis of tuberculosis. In one of the reported cases there was no significant change in the appearance of the lung fields during the last five weeks of life and in another the pulmonary changes apparently persisted for eight months.

3. Although atelectasis was seen in only 1 of the 4 cases reported, the large amount of purulent, tenaceous exudate present would be expected to produce atelectasis.

4. Bronchiectasis is present in a large number of cases of this disease but its definite demonstration is dependent upon the injection of opaque media, which was not done in any of the 4 cases which are presented.

5. There is evidence of abnormal intestinal motility as indicated by the presence of gaseous distention and fluid levels.

6. The average age at onset is apparently two to three months and most of the infants die before they reach the age of two years.

HAROLD C. OCHSNER, M.D.

Lewis, R. W.: Roentgenographic Soft-Tissue Study in an Orthopedic Hospital. *Am. J. Roentg.*, 1942, 48: 634.

The author believes that soft-tissue shadows on roentgenograms are not sufficiently appreciated or studied. In orthopedic practice, most roentgen diagnoses are based wholly or in part on soft-tissue findings. Special films are not necessary. In most portions of the body, bones and soft tissues can be studied satisfactorily on the same films, provided that (1) the films are not made unnecessarily dark, and (2) different intensities of illumination are used in studying the films.

Among the conditions in which soft-tissue findings are of value are arthritis, bursitis, cysts, ganglia, neoplasms, tenosynovitis, trauma, and blood-vessel lesions, and examples of all are described and illustrated.

A. HARTUNG, M.D.

Howes, W. E., and Camiel, M. R.: Contact Roentgen Therapy. *Am. J. Roentg.*, 1942, 48: 360.

Contact or short distance roentgen therapy derives its name from the fact that the roentgen tube can be placed in direct contact with the area to be treated. It is ideal when the entire effect of the rays is required superficially and when deep penetration is best avoided. The history of its development is reviewed briefly.

Applicability of this type of therapy is most suited to the following circumstances:

1. Pathological conditions at or near the surface with limited infiltration.

2. Lesions in the accessible body cavities, such as the mouth, vagina, or rectum.

3. Tumors which can be exposed surgically, such as those in the bladder or stomach.

4. The area should be of limited dimensions.

This method of therapy has the advantage of convenience, speed, and economy. It must be used strictly within the field of applicability. Special precautions are essential because inadequate provisions for protection of the operator are inherent in the apparatus commonly used. Dosage measurement may be inaccurate as the intensity of the output is so great.

The apparatus in use with this type of therapy is described and consideration is given to the physical factors involved. The dosage used under various conditions and the method of giving it is discussed at some length. The histopathological changes in the tissues following treatment is also presented. Special attention is called to the need for accurate localization of the lesion and proper positioning to include all of the involved area.

One hundred cases treated at the Brooklyn Cancer Institute with contact roentgen therapy are reviewed and tabulated as to type and location of the lesion. Basal-cell carcinomas in the skin in various places about the head and face comprised 55 per cent of the entire series; they are discussed in detail and the results obtained with them are tabulated. Cases of squamous-cell carcinoma, adenocarcinoma, keratoses, Kaposi's disease, verrucae, corns, furunculosis, acne, keloid, and hemangioma are also given consideration. In their summary the authors state that the contact method of roentgen treatment is of distinct advantage in treating superficial lesions.

A. HARTUNG, M.D.

Medinger, F. G., and Craver, L. F.: Total Body Irradiation, with a Review of Cases. *Am. J. Roentg.*, 1942, 48: 651.

Irradiation of the entire body was first employed with the hope of devitalizing or destroying all wandering malignant cells or early metastatic foci without destruction of the host. The development of the method and experimental data relating to it are reviewed, as are also the technique, field of application, and results obtained with it by various authors. Analysis of the literature shows a general agreement that total irradiation produces its best results in the lymphomatoid diseases with few groups reporting favorable palliation of advanced metastatic cancer.

The present report presents a critical analysis of 270 cases treated at the Memorial Hospital over a ten-year period, from 1931 to 1940. The purpose of this study was (1) to determine, more exact indications for total-body irradiation; (2) to evaluate the end-results, not only as measured by palliation, but as regards survival rates following therapy of Hodgkin's disease, lymphosarcoma, and the leucemias; (3) to compare the survival rates of patients thus treated with those of patients receiving no treatment or given other forms of therapy; (4) to determine the exact dangers and contraindications to this method; and (5) to analyze the various changes in the blood picture following total body irradiation.

The treatment used in the cases reviewed is based on the plan, initiated by Heublein and his collaborators, of giving continuous irradiation with hard roentgen rays of low intensity at long target-skin distance. The following factors were employed: 185 kv., 1 ma., 5.5 mm. of copper equivalent, and 3 meter distance from the roentgen tube to the patient. The output was 0.86 roentgens per hour, or about 1/2 roentgens per day (dose measured in air).

The cases analyzed included 94 of Hodgkin's disease, 30 of lymphosarcoma, 76 of lymphatic leucemia, 12 of myelogenous leucemia, 5 of polycythemia vera, 6 of mycosis fungoides, 11 of multiple myeloma, and a miscellaneous group of 35 patients having advanced carcinoma or sarcoma with generalized metastases. Most of the patients received local irradiation in addition to total body irradiation for it was realized that the latter alone offered relatively poor results. Each of the groups are discussed in detail in connection with the special information desired for the purposes of this study, and tables and charts are included showing the results obtained. Comparative studies with patients treated otherwise are also given consideration. Attention is called to the great variety of factors which influence dosage and the method of administration in the individual case and account for the variable results obtained.

The following conclusions are given:

1. Total body irradiation has its greatest usefulness in the treatment of the lymphomatoid diseases. Little or no benefit follows its use in the treatment of generalized carcinoma or sarcoma.

2. The survival period as well as the period of active useful life is prolonged in patients with Hodgkin's disease, lymphosarcoma, and chronic lymphatic leucemia who are treated by total body irradiation.

3. Favorable palliation followed the use of total body irradiation in small groups of patients with chronic myelogenous leucemia, polycythemia vera, mycosis fungoides, and multiple myeloma.

4. Acute lymphatic and myelogenous leucemia are not benefited by this therapy.

5. The most favorable results for the treatment of the lymphomatoid diseases were seen in those cases with early localized disease in which obliterative therapy by local roentgen irradiation or surgery preceded total body irradiation.

6. Total body irradiation is a useful adjunct to local roentgen therapy in the treatment of the lymphomatoid diseases.

A. HARTUNG, M.D.

Hemphill, J. E., and Noojin, R. O.: North American Cutaneous Blastomycosis Treated with Superficial Roentgen Therapy. A Report of 4 Cases. *Am. J. Roentg.*, 1942, 48: 643.

Although superficial roentgen therapy is mentioned in the literature as a method of treatment for

North American cutaneous blastomycosis, very few detailed accounts of this form of treatment are given. The authors' purpose in this report is to summarize briefly 4 cases treated in this manner and to suggest what they found to be a practical method of handling this extremely resistant and chronic condition.

The lesion is discussed from its pathological and clinical aspects. Diagnosis is ascertained through (1) history and appearance of the lesion, (2) potassium-hydroxide slide preparation of the organism from the tissue borders, (3) biopsy, (4) culture, (5) intradermal test, and (6) complement-fixation reaction.

In the treatment the administration of iodides and superficial roentgen therapy are definitely efficacious, particularly in combination, and the two represent the treatment of choice, provided the patient is not allergic to the fungus, as potassium iodide is extremely dangerous to the hypersensitive patient.

The importance of determining the state of hypersensitivity by the intradermal test is strongly emphasized. Reduction of the allergic reaction is accomplished by the administration of small doses of heat-killed vaccine. Unless this desensitization is carried out before the administration of iodide, dissemination of the disease may occur. After some reduction of the hypersensitivity has been accomplished, iodides can be started cautiously.

Roentgen therapy for this condition is administered according to the principles observed in inflammatory lesions. It consists of a series of single treatments, administered at weekly or ten-day intervals, of a total dosage sufficient to produce smoothing of the borders and to remove signs of activity. The total dosage required varies with each individual and the seven-to-ten-day interval between treatments is advisable in order to prevent cumulative effect and overdosage; 1,500 roentgens or less should be adequate. This treatment, in conjunction with the medical measures outlined, stops activity within the spreading borders, eliminates secondary infection, and hastens regression of the chronic inflammatory reaction. The sooner roentgen therapy is started, the less deforming will be the scar. There is no logical contraindication to roentgen therapy even in the patient who is sensitive to his own organism, while he is being desensitized.

A. HARTUNG, M.D.

RADIUM

Jones, H. W., Jr.: Carcinoma of the Cervix. Clinical Evaluation of Radium Dosage and Supplementary Roentgen Irradiation, Based on a Study of 915 Cases. *South. M. J.*, 1942, 35: 959.

A statistical analysis has been made of 915 histologically proved cases of carcinoma of the cervix treated at the Kelly Clinic, Baltimore, Maryland, from October 1, 1927, through December 31, 1935, the results of which are presented in this report. Emphasis has been placed on the correlation of the clinical stage of disease, irradiation dosage, and curability.

The cases studied are tabulated as (1) primary cases; (2) stump cases; (3) cases previously treated elsewhere; (4) recurrent cases; and (5) prophylactic cases. The nature of the cases included in each of these groups is briefly commented on.

The principles of treatment of primary cases are discussed at length. For statistical purposes all cases have been classified as to clinical stage, according to the League of Nations classification, and further subdivided according to the treatment received. The technique and dosages of both radium and roentgen-ray irradiation are described in detail. A detailed analysis of these emphasizes the fact brought out by many observers that the clinical stage of the disease is of paramount importance in determination of the prognosis. Higher dosages produced more favorable outcomes. The survival rates shown indicate the great value of supplementary x-ray therapy.

The results obtained in stump cases as a group were somewhat better than in primary cases as a whole, provided the diagnosis of carcinoma had been made two years or more after the supracervical hysterectomy. The principles of treatment of this group are similar to those for primary cases. Recurrent cases also yielded gratifying results; their treatment was less extensive than that carried out in previously mentioned groups.

Prophylactic cases, including only those in which all gross evidence of growth was removed at operation, yielded a salvage rate of only 40 per cent in this small series, even with supplementary x-ray therapy. This does not compare favorably with the radium cure rate in Stage 1 (or even Stage 2) primary cases with which these prophylactic cases must be compared.

The cases previously treated elsewhere formed such a heterogeneous group that no routine treatment could be employed with them. Generally speaking, the treatment administered must be integrated with previous exposures and local situations.

Tables are included, which give the results of treatment in connection with all the groups studied, details of the number of cases, five-year survivals, absolute cure-rate percentages, and other data. The relation of treatment dosage to prognosis is also tabulated.

A. HARTUNG, M.D.

MISCELLANEOUS

Treadwell, A. deG., Low-Beer, B. V. A., Friedell, H. L., and Lawrence, J. H.: Metabolic Studies on Neoplasm of Bone with the Aid of Radioactive Strontium. *Am. J. M. Sc.*, 1942, 204: 521.

After reviewing the literature concerning the investigations on the metabolism of calcium and strontium by study of their inert and radioactive forms, the authors present preliminary clinical studies which they have performed with the aid of radiostrontium on bone metastases of 6 cases of carci-

TABLE I.—UPTAKE OF RADIOSTRONTIUM—MICROCURIES PER GM. AND PERCENTAGE OF DOSE PER GM.—TISSUE—WET WEIGHT

	Case 1	Case 2*	Case 3	Case 4	Case 5	Case 6
Normal bone: uc/gm.	0.244	0.0131	0.0542	a 0.0320 b 0.0244		0.078
Per cent dose/gm.	0.016	0.0011	0.015	a 0.0098 b 0.0070		0.012
Infiltrated bone: uc/gm.	0.0498	0.0073	a 0.1461 b 0.1586			
Per cent dose/gm.	0.034	0.0006	a 0.041 b 0.044			
Tumor: uc/gm.	0.0361		0.096	a 0.0106 b 0.0122	0.0483	0.588
Per cent dose/gm.	0.0246		0.0279	a 0.0032 b 0.0033	0.082	0.090
Skin: uc/gm.	0.342	0.0064	0.0772	trace	0.0086	
Per cent dose/gm.	0.022	0.0005	0.0215		0.0014	
Muscle: uc/gm.	0.1475	0.0036	0.0052	trace	0.0124	0.0005
Per cent dose/gm.	0.010	0.0003	0.0014		0.0021	0.0007
Fat: uc/gm.	0.0066	0.0036	0.0002	trace	?	
Per cent dose/gm.	0.0004	0.0003	0.0005			

*The short interval between the administration of radiostrontium and amputation, twelve hours, together with the fact that the radiostrontium was given orally, probably accounts for the small uptake in all tissues.

noma of the breast and prostate. They have administered small doses of radioactive strontium prepared in the Berkeley 60 in. cyclotron by bombardment of metallic strontium with 16,000,000 volt deuterons to patients, prior to biopsy or amputation, and assayed the tissues to determine the uptake. For this purpose, the tissues under question were reduced to aliquots of approximately 1 gm. wet weight, ashed at 400° C., and assayed for radioactivity on a standardized DuBridge electrometer or a Geiger counter, the uranium standard being used for comparison. The procedures and results obtained in the 6 cases are given individually in short resumes.

Table I, above, illustrates the findings in a general way.

It may be noted from this table that the maximum uptake of radiostrontium occurs in the bone, tumor tissue, and the skin. It is of special importance that areas where new bone is being laid down, whether this be normal or neoplastic, show an even higher uptake of strontium which suggests that, as with radioactive phosphorus in the case of soft-tissue cells, the rate of bone new formation could be determined with labelled or radioactive strontium. It is also possible that the administration of large doses of radiostrontium in conjunction with irradiation by means of external agents, such as roentgen rays, radium, or neutrons, may serve to enhance the effect of the latter in certain cases of bone tumors. The role of the skin in strontium metabolism needs also further elucidation. The authors are presently pursuing investigations on all these problems and in later publications will describe the results.

T. Leucutia, M.D.

Kenney, J. M., and Craver, L. F.: Further Experiences in the Treatment of Lymphosarcoma with Radioactive Phosphorus. *Radiology*, 1942, 39: 598.

Lymphosarcoma, almost always a systemic disease, tending to spread progressively through the lymphoid-tissue-bearing regions, is usually treated with local irradiation of the clinically demonstrable lesions.

Medinger and Craver have observed a longer survival period and a longer period of remission in patients who received whole-body x-irradiation by the Heublein technique after the completion of local x-ray therapy, than in those who had the latter alone. It would appear that small, clinically nonevident foci of disease were inhibited or destroyed by this method, which is not preferential as all tissues of the body at the same depth receive the same dose.

Radioactive phosphorus is used as a therapeutic agent because of the fact that it emits beta rays. It is administered orally or parenterally and is absorbed in varying amounts by all body tissues. The average lymph node invaded by lymphosarcoma has a differential absorption ratio of 3.5, or three and a half times as much as it would have if the isotope were distributed uniformly to all parts of the body. When amounts of P^{32} comparable to those used in the treatment of leucemia are administered to patients with lymphosarcoma, the sites of disease should receive tumor doses comparable to that administered during conventional x-ray therapy. During such treatment the bone marrow may be injured and frequent blood counts and bone marrow aspirations must be made to determine whether such injury has occurred.

The P^{32} was administered in courses of from 80 to 120 microcuries per kilogram of weight, at intervals of from seven to fourteen days. The time interval permits an observation of the effect of the isotope on the disease, and of damage to the hematopoietic system. Each course was divided into from four to six parts, given on consecutive days, since the absorption is better if small amounts are administered, and since changes in the blood can be better observed. The total amount given to any one patient varied from 150 to 400 microcuries per kilogram with an average of about 250 microcuries, and was dependent upon the response to the therapy.

If the leucocyte count fell below 3,500, or the platelet count below 100,000, or if the red count was decreased by more than 15 per cent of its original value, administration of P^{32} was usually temporarily discontinued until the depressed element rose to near its original level. Usually the leucocyte and platelet counts were the ones first affected. A sternal marrow aspiration was performed before therapy was started, was repeated after 200 microcuries per kilogram had been administered, and thereafter it was done after each additional 100 microcuries. If comparison of these biopsies showed damage to the marrow cells, therapy was discontinued. When the initial marrow biopsy showed an abnormal number of lymphocytic elements, or a subnormal amount of erythropoietic tissue, P^{32} was administered very cautiously. In such instances, the usual course was from 40 to 60 microcuries per kilogram, and the interval between courses was at least ten days.

Twenty-two unselected patients with a proved diagnosis of lymphosarcoma and evidence of active disease have now been treated with radioactive phosphorus. Ten patients, 46 per cent, have had complete remissions and have been free of recurrence for from three to twelve months; 2, or 9 per cent, have had recurrences which were controlled by additional therapy. Three, or 14 per cent, have had 75 per cent regression of the disease. Six of the living patients had had previous x-ray therapy which had completely controlled the disease in 3 and partially controlled it in the remaining 3.

Twelve patients, 54 per cent, are dead; 10 of these, 46 per cent, were at no time benefited by isotope therapy. Eleven received x-ray therapy subsequent to the failure of radioactive phosphorus, without any appreciable control of the disease. Five of these had been treated with x-rays prior to treatment with P^{32}, with partial control in 2 and no control in 3 cases. Five patients were clinically classified as having leucosarcoma, the acute phase of lymphosarcoma.

The period of remission, which is still unbroken in the successfully treated patients, has been longer in 2 patients than had been noted after previously administered x-ray therapy. The authors believe that both primary and secondary use of P^{32} is valuable and is indicated in virtually all cases of lymphosarcoma.

HAROLD C. OCHSNER, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Allen, J. G., and Julian, O. C.: Prothrombin and Hepatic Function. *Arch. Surg.*, 1942, 45: 691.

Benign gastric tumors have received rather minor consideration in the literature compared to that accorded to ulcers and malignant lesions, a fact probably due in part to lack of recognition, errors in diagnosis, critical illness of the patient, or the frequency of malignant degeneration.

The majority of benign tumors may give few or no symptoms, and may be completely overlooked during life. However, the general estimate that from 0.5 to 5 per cent of all gastric tumors are benign is apparently too low. The figure is probably nearer 15 and 20 per cent. The association of ulceration, gastritis, and malignant disease with benign gastric tumors has easily recognized importance.

A bare one-third of these tumors were correctly diagnosed before operation. The authors consequently list some facts more or less characteristic of benign gastric tumors, which may contribute toward an adequate appreciation and early diagnosis.

First, the large majority of patients coming in for treatment give a history of some protracted gastric disturbance. The patient has more or less neglected these symptoms until driven to the hospital by one or more severe complications, the commonest initial one being gastric hemorrhage. Pyloric obstruction was next in frequency and either progressive or intermittent in character, according to the location and type of tumor. The sessile type of pyloric tumor accompanied by pylorospasm frequently produced persistent and progressive symptoms of obstruction. The pedunculated and mobile benign tumors distant from the pyloris presented a contrasting picture. Strangulation may be a serious complication of these tumors while gastritis of varying degree is frequently observed.

While the hazards of severe hemorrhage and malignant degeneration were considered valid indications by the authors for surgical treatment for all benign gastric tumors, local excision usually sufficed, except for the sessile adenomatous polyps at the pylorus. Gastric resection was advised in this subgroup of tumors in view of the high incidence of degeneration due to malignancy.

STEPHEN A. ZIEMAN, M.D.

Wangensteen, O. H.: The Controlled Administration of Fluid to Surgical Patients. *Minnesota M.*, 1942, 25: 783.

There are essentially four problems which bear upon the issue of fluid requirements of patients undergoing operation: (1) water requirement; (2) electrolyte needs; (3) blood-loss factors; and (4) caloric and nitrogen requirements of the patient.

In administration of water to a patient after operation, the surgeon may fall into the error of giving either too much or too little. Both mistakes may be followed by grave consequences. Patients with severe dehydration may exhibit shock and die because of lack of enough available water to supply the tissue cells with the requisite amount of fluid. Too much fluid is particularly hazardous in the older patients with impaired cardiac reserve. Increase in blood volume may provoke cardiac failure and pulmonary edema. When the patient hydrates himself by drinking water, satisfaction of the sense of thirst is a fair criterion of the status of hydration. When an inlying duodenal tube is present, however, hydration is accomplished by the parenteral method, and the most readily available guide to the status of hydration is the urinary output and the specific gravity of the urine.

There are surgeons who insist that determination of the values for hemoglobin, hematocrit, and plasma protein will solve the problem of dehydration, especially if preoperative values are available. Wangensteen ingeniously resorts to routine weighing of all patients following a major operation. If the preoperative weight has been exceeded, and enough fluid has been given so that a satisfactory urinary output reasonably could be expected and oliguria continues, there is no need to give more fluid. Weight increases of from 4 to 5 per cent over the patient's preoperative weight points to over-hydration.

Dehydration may accompany prolonged vomiting, the use of indwelling duodenal tubes without adequate replacement of fluids, diarrhea, abnormal sweating, and profound diuresis provoked by too rapid administration of hypertonic glucose solution.

The kind of fluids to be given is a matter every surgeon should consider. Normal saline solution does not afford the kidney a vigorous impetus for the excretion of urine and may result in the retention of sodium chloride and water. Daily excretion of 2 or 3 gm. of sodium chloride in the urine would suggest that enough salt has been given, whereas the more accurate index of sodium-chloride balance is found in the determination of the plasma-chloride level. Whenever imbalance of the sodium electrolyte equilibrium may be present, the surgeon should detect this deficiency. For the ordinary postoperative patient from 5 to 9 gm. of salt daily suffices. Anesthetized patients notably lose considerable fluid by perspiration, because of the vasodilating effect of anesthesia on the skin capillaries. Beyond the requirements of sodium chloride, necessary fluids should be given as glucose solution. The liberal administration of a dilute glucose solution will assist in adjusting a diminished plasma volume provided at the same time surplus water is given to aid the kidney in eliminating the sodium or chloride ion present in excess.

A brisk bleeder with a deep wound can pyramid blood loss astonishingly in a minute. During those few anxious moments, more blood can be shed than through the whole ordeal of a lengthy and trying operation. The weighing of sponges permits the determination of blood loss within the accuracy of a few grams. And because of the lack of reaction attending the administration of plasma, the author prefers plasma to blood and allows it to run into one of the patient's leg veins throughout the operation in such a manner that the patient has received from 100 to 200 cc. more plasma than the total increment of gain in the weight of the sponges. The blood loss must be made up so that the patient does not have to tolerate both operation and blood loss.

Surgeons have been very remiss, Wangensteen thinks, in meeting the caloric and nitrogen requirements of patients convalescing from operation. Enough glucose is given, ordinarily, to offset the ketosis of starvation, but not enough to meet the energy requirement of the patient. Maintenance of the caloric balance is important for the postoperative patient as well as for the patient who awaits operation or who has lost weight because of inability to take food. During the ketosis of starvation, the glycogen and protein deposits in the liver are exhausted and fatty infiltration occurs, and patients with fatty livers are notably poor risks for operation. Ravdin and his associates have demonstrated that a combination of high protein and carbohydrate diet by mouth is particularly efficacious in removing fat from the liver and replenishing the normal glycogen and protein deposit stores. Brunschwig has proved that the nitrogen equilibrium may be maintained by the intravenous administration of available commercial aminoacids alone, combined with liberal quantities of carbohydrates as a protein sparer. However, nitrogen balance may be achieved by the intravenous injection of plasma protein. STEPHEN A. ZIEMAN, M.D.

Bradish, R. F., Everhart, M. W., McCord, W. M., and Witt, W. J.: Some Physiological Aspects of the Use of Sea Water to Relieve Dehydration. *J. Am. M. Ass.*, 1942, 120: 683.

The authors sought to prove experimentally whether or not sea water could be concentrated by the colon to make water available to the organism. Experiments were conducted on 3 dehydrated army medical officers who volunteered as subjects and on a hospital patient with an apparently normal colon, who had had a colostomy. In the 3 volunteer subjects filtered sea water of approximately half the salt content of open ocean sea water was instilled through the rectum into the colon by means of a soft rubber catheter. More concentrated sea water was inserted into the distal colon of the patient with the colostomy. Sodium chloride contained in the sea water was absorbed, as expected, from the colon. The colon was unable to concentrate sea water and make water available to the organism. Rectal instillations of sea water will, therefore, not alleviate the symptoms of water deprivation. The authors are convinced that the use of sea water *per se* by this means would not prolong life but would actually hasten death. WALTER H. NADLER, M.D.

Beecher, H. K., McCarrell, J. D., and Evans, E. I.: A Study of the "Shock-Delaying" Action of the Barbiturates. *Ann. Surg.*, 1942, 116: 658.

In a study using 40 mongrel dogs, the work of Seeley, Essex, and Mann was repeated insofar as their two major groups of dogs are concerned. Their observation that shock produced in dogs by exposure and manipulation of the intestines is slower to appear when barbiturate (sodium amytal) anesthesia is used than when ether anesthesia is employed was confirmed. However, no significant delay was found in the onset of shock produced by hemorrhage when sodium amytal was compared with ether anesthesia. This result and observations of other writers indicate that, as compared with ether anesthesia the barbiturates are not useful in delaying all types of shock. They seem to delay shock, in comparison with ether, only when the chief shocking trauma is dehydration or plasma loss from the wound surfaces.

Recommendations to the effect that barbiturates be administered routinely to all seriously wounded men involve several assumptions. However, it is not true, if one can judge by the results in dogs, that these drugs will be of value in shock from any cause. Also, a comparison of the barbiturate data with the ether data—which revealed a slower appearance of certain types of experimentally produced shock with the former anesthetic—is not the same thing as a comparison of barbiturate data with data taken in the absence of anesthesia. No data are available to indicate that the onset of shock is slower under barbiturates than in unanesthetized subjects. The experiments presented showed no significant delay from the administration of approximately 100 per cent oxygen as compared with the presence of room air only, in the onset of shock due to bleeding under either a barbiturate or ether anesthetic. WALTER H. NADLER, M.D.

Landau, E., Logue, V., and Kopelman, H.: Pholedrine in the Prevention of Operative Shock. *Lancet*, Lond., 1942, 243: 210.

The authors reported 10 cases in which pholedrine was used as a prophylactic measure in the prevention of shock, and also as a therapeutic antishock measure. They found this drug of great value, it seemingly having a longer and more positive action than adrenaline, ephedrine, and other vasoconstrictors. However, once "irreversible" shock has developed, pholedrine is of no value.

LUTHER H. WOLFF, M.D.

Beattie, J., and Collard, H. B.: Plasma Protein Storage. *Brit. M. J.*, 1942, 2: 507.

The authors report their observations in experimental studies made to determine the source of

plasma protein reserve. The methods used in these studies are described and the observations are recorded in detail and by tabulations.

After repeated transfusions of plasma with a protein content lower than that of the animal's blood, the plasma protein content showed significant rises in 4 of 5 animals, and a rise of doubtful significance in 1.

The retention of the plasma protein in the circulation may be accomplished by increasing the concentration to a much higher level and by expanding the blood volume. In answer to the question, "What determines whether plasma protein moves from the blood or is retained in it?" it has been suggested that the state of the plasma protein stores may be the most important factor. In the experiments reported herein, repeated plasma transfusions show that the plasma reserve stores may become saturated with protein and that further transfusions will lead to a rising plasma protein concentration and plasma volume.

Other workers have envisaged a steady state, or an ebb and flow, between the plasma proteins and those in the body cells. That idea presupposes two reservoirs of protein, one in the blood stream and the other in the tissue cells. A state of equilibrium between the two reservoirs tends to appear, and the speed with which it is accomplished will depend on the "gradient" of the "levels" of protein in the tissue cells and in the blood stream. If the level of available plasma protein is low in the tissues, then high degrees of hypoproteinemia may persist. On the other hand, a high level of protein in the blood stream will only remain high if the protein reserves are also high.

The isolated liver experiments show clearly that the liver can mobilize and throw into the perfusing fluid quantities of plasma protein. The stimulus for this production is obviously the low plasma protein concentration of the perfusing fluid. The authors conclude that the liver can add plasma protein to or abstract it from the blood. The direction of the movement depends on the state of the liver reserves and the plasma protein which is contained in the blood.

There can be no doubt, therefore, that the liver does behave as a store for plasma protein. In order to determine, however, if it were the only store, hepatectomized animals were prepared and after variable periods they were given plasma transfusions.

The results of these experiments indicate a lowering of protein into the other stores, but they are not as convincing as evidence of movement from such stores into the blood. The authors conclude that protein stores from which plasma proteins may be derived, or in which plasma protein can be placed, exist apart from the liver. Whether all body cells can contribute protein to the blood stream with the facility with which they apparently can withdraw it has yet to be decided.

HERBERT F. THURSTON, M.D.

Glenn, W. W. L., Peterson, D. K., and Drinker, C. K.: The Flow of Lymph from Burned Tissue, with Particular Reference to the Effects of Fibrin Formation upon Lymph Drainage and Composition. *Surgery*, 1942, 12: 685.

Inflammatory processes differ in their tendency to spread in relation to the local irritation which they have caused. Inflammation has as its simplest elements, (1) a great increase in capillary permeability, which floods the tissues with a slightly diluted blood plasma containing fibrinogen and prothrombin; (2) a variable amount of tissue injury; and (3) the migration of leucocytes. Lymphatic blockage by thrombosis and the conversion of the extravascular milieu into a fibrinous clot are of paramount importance in checking the spread of inflammation. The formation of fibrin lymphatically and extravascularly is due to the free escape of fibrinogen and prothrombin from the blood capillaries and the release of thromboplastic substances from injured cells. The point to be borne in mind is not that inflammation is of itself circumscribed, but that the destructive character of the inflammatory agent is extremely important in the localizing process. The more nearly the invading organism and the host are compatible, the more readily the invader spreads. If, however, the irritant causes cell destruction and outpouring of plasma from blood capillaries, then extravascular coagulation begins at once, and the whole extravascular environment becomes a blood clot, which extends into the lymphatics. If blood capillaries are open through such regions, they will perform their functions of delivery and absorption of water and solutes, but lymph drainage with gradual spread of bacteria, viruses, or certain poisons will become negligible.

Since burns have become a major problem in this war, and the issue of drainage from them has been of great moment, experiments were undertaken to study the lymph flow from tissues severely burned by surface scalding, the extent of lymphatic blockage and extravascular deposition of fibrin, and the possibility of shutting off lymphatic drainage by causing coagulation of all the fibrinogen escaping from the blood capillaries.

The standard burn was produced by dipping the foot of a dog, anesthetized with nembutal, into water at a temperature of 100° C. for two minutes. The burn so produced is severe. The underlying skin is porky and blanched except at the margin of the burn, where dilated, congested vessels are seen.

Immediately following the burn there was a spontaneous flow of lymph which increased rapidly for the first three to six hours and then diminished gradually during the next twenty hours. The protein percentage likewise increased sharply, and this increase was maintained until the end of the experiment. Tissue fluid protein, when quantitated, was approximately the same as the lymph protein.

If, immediately following the burn, the foot is infiltrated subcutaneously with tissue extract made by grinding fresh beef lung, so that coagulation is

maximal, lymph flow is negligible and lymph protein is high. Extensive fibrin formation can be seen in the foot which has been burned and injected with tissue extract. The opposite foot, which has been burned but given no extraneous supply of thromboplastic material, shows only a meager amount of fibrin on section, and it is obvious that coagulation has been insignificant.

If the burned area was injected subcutaneously with tissue extract at the end of three hours, when lymph flow was rapid and the swelling intense, the lymph flow stopped instantly and during a period of twelve hours was not resumed.

Local swelling depends notably upon the degree to which coagulation of the exudate occurs, with imprisonment of water which leaks from the blood capillaries.

These findings are of practical importance. Lymphatic drainage can be blocked almost instantly and completely if the region damaged is either supplied with tissue extract artificially, or, through the nature of the accident, is so crushed and mutilated as to supply tissue extract naturally and thus bring about immediate coagulation of the exudate or blood from the capillaries. There is no doubt that localization of a spreading irritant, such as is faced in the growth of bacteria in an area of infection, may be beneficial. In severe burns, however, it is probable that a toxin is absorbed directly into the blood from the burned areas; and while the same toxin is present in the lymph from such regions, blood absorption is so constant and so great as to cause death, even though the factor of lymphatic participation in the disaster is excluded.

SAMUEL KAHN, M.D.

Lipschuetz, A.: Experimental Fibroids and the Antifibromatogenic Action of Steroid Hormones. *J. Am. M. Ass.*, 1942, 120: 171.

Subserous uterine fibroids were first elicited in the United States by Nelson in a number of guinea pigs subjected to prolonged treatment with estrogens. Independently the author has also produced fibroids in guinea pigs. Two new facts of considerable interest were also established. First, not only uterine but also extragenital subserous fibroids in the abdominal cavity can be elicited by estrogens; fibroids present themselves in the mesentery, the spleen, the pancreas, the abdominal wall, and in other locations. Secondly, under certain quantitative and timing conditions of treatment with estrogens a female guinea pig only rarely escapes the development of abdominal fibroids.

All estrogens, natural and artificial, free and esterified, were shown to be tumorigenic. Continuous action is an essential factor of tumorigenesis elicited by estrogens. When each week of injections was followed by two weeks free of treatment with a powerful tumorigenic ester, the experiment was prolonged for an entire year without the production of fibroids. On the other hand, minute quantities of free estradiol quite insufficient to produce fibroids when given thrice weekly by subcutaneous injections proved to be highly active when absorbed steadily from a pellet which was implanted subcutaneously.

On the assumption that there is an antagonism between steroid hormones, the author investigated the antitumorigenic properties of a number of antiestrogenic substances. Progesterone, testosterone, and desoxycorticosterone were all found to have antitumorigenic properties when administered simultaneously with doses of an estrogen ordinarily capable of producing fibroids. Desoxycorticosterone was nearest to progesterone as to its activity, whereas testosterone appeared to be less active. However, antifibromatogenic activity seems to be the expression of the antiestrogenic faculty of certain steroids and is not necessarily coincident with their progestational, cortical, and estrogenic activity. This is a very important feature of the problem.

The author asks: "Will the same steroids also cause regression of existing uterine and other fibroids?" He answers: "This is very likely."

When discussing the practical application of this experimental work with steroid hormones, one must not forget that the tumorigenic and antitumorigenic actions of steroid hormones vary greatly according to the species. However, the author suggests that there may be an application to human beings. In fact, testosterone has been administered for the treatment of fibromyoma in human beings has resulted in variable clinical success.

DANIEL G. MORTON, M.D.

Steiner, P. E., Kluever, H., and Brunschwig, A.: Three Carcinomas of the Tongue in 2 Monkeys. *Cancer Research*, 1942, 2: 704.

The factors predisposing to carcinoma of the tongue in man are: (1) trauma from broken teeth or poorly fitting dentures, (2) the use of tobacco, especially pipe smoking, (3) the ingestion of excessively hot foods, (4) syphilis, (5) vitamin deficiency, and (6) heredity. The simultaneous occurrence of 3 carcinomas of the tongue in 2 monkeys in which apparently none of these factors were involved is of interest. In its clinical course and its gross and microscopic pathology the disease resembled that seen in man. As is usual in man, the victims were elderly males.

The authors report 3 squamous-cell carcinomas of the tongue which occurred simultaneously in 2 macaque monkeys. One animal died of aspiration pneumonia with local tumor metastases, and the other died postoperatively without metastases. Attempts at transmission were made, but the results were negative after three and one half months. None of the commonly quoted etiological factors for cancer of the tongue in man was present, except that both monkeys were elderly males. Both had experimental lesions of the brain of long standing. This is the first report of cancer of the tongue in subhuman primates, and also the first in undomesticated animals.

SAMUEL KAHN, M.D.

Menke, J. F.: Further Experiments on the Extraction of a Carcinogenic Factor from Human Cancerous Tissues. *Cancer Research*, 1942, 2: 786.

In a preliminary report an announcement was made by the author that a lipoid extract of two primary human mammary cancers had produced sarcomas at the site of subcutaneous injections in mice of a well known, low spontaneous tumor strain. Since that time additional experiments have been performed, and although the further results are still inconclusive, it seems desirable to the author to make a progress report at this time. The investigation was started on the assumption that human cancerous tissue might contain a carcinogenic factor resembling the known synthetic compounds. The possibility did not seem unlikely when one noted the close relationship between these agents and the normal steroid compounds of the animal body. The property of fat-solubility, common among the known carcinogenic agents, stood out as a characteristic that might also be common to a hypothetical human carcinogenic factor. This suggested the extraction of human cancerous tissue with fat solvents as a method that might yield a crude extract in which carcinogenic activity could be demonstrated by subcutaneous injection into mice of known low spontaneous tumor incidence.

The extracts were tested by subcutaneous injection only. In females, and in some males, the injections were made in such a way as to infiltrate the subcutaneous area beneath the left and right caudad nipples; in the males, the location of the nipple was approximated. Most of the male animals, however, were injected subcutaneously in the right and left anterior axillary regions. The mice received from 2 to 4 injections alternately on the left and right sides at intervals of one to three weeks.

In a series of 36 mice treated with extracts of three primary cancerous nodules obtained from surgically removed specimens of carcinomatous human breasts, 7 developed sarcomas at the site of injection. In a series of 33 mice treated in a similar manner with an extract of a carcinomatous breast in which the primary cancerous nodule was absent, none developed a tumor at the site of injection. In the combined series of 280 mice, 108 males and 172 females, 38 females developed a hyperplasia of the anal sebaceous glands and prolapse of the rectum. Thirty-six of these anal lesions occurred among 129 females treated with the extracts of cancerous tissues. Two anal lesions occurred in the series of 43 females treated with the extracts of noncancerous tissues.

The author recognizes the possibility that the occurrence of sarcomas in the animals treated with the whole extract of primary cancerous nodules may well be due to some nonspecific factor or factors. Sarcomas have resulted from the subcutaneous injection of many substances of a nonspecific nature. However, if for the purpose of discussion of these limited results the demonstrated factor is assumed to be of a specific nature, then a tentative suggestion

Fig. 1. Tumor at site of injection of extract of primary human mammary carcinoma.

can be made concerning its probable chemical nature.

Apparently the factor is not related to the carcinogenic hydrocarbons. The results suggest a more labile type of compound, susceptible to alteration when subjected to the conditions of alkaline hydrolysis at moderately high temperatures. Since those working with extracts of human liver have found that the carcinogenic activity is present in the nonsaponifiable fraction, it appears that the factor present in the whole extracts of primary mammary cancer is of a different nature.

The failure of the whole extracts of mammary cancerous tissue from specimens in which the primary tumor was present, to produce tumors at the site of injection suggests that the factor either is present only in the cancerous tissue of the primary nodule or is in greatest concentration there, and that that portion of the extract obtained from the surrounding uninvolved fat diluted the active factor from the cancerous nodule to an insufficient concentration.

Because of these results, the method of preparation has been changed for further experiments now under way. The extracts are now being made by a method in which room temperature is the maximum reached once the body heat has been removed by prompt freezing of the surgical specimen. The use of a nitrogen atmosphere is also being added to the method. Until the results of these further investigations have been obtained, conclusions are purposely being avoided. JOSEPH K. NARAT, M.D.

Campbell, E., Meirowsky, A., and Tompkins, V.: Studies on the Use of Metals in Surgery. *Ann. Surg.*, 1942, 116: 763.

The purpose of this study was to find an alloy that was nontoxic, strong, light, and also malleable so as to permit working and shaping during the operation. A previous study showed that wrought ticonium, vitallium, and cast ticonium (with beryllium) were not toxic to chick fibroblasts in tissue culture. This article reports results with these three alloys in the repair of cranial defects in dogs, along with some observations on electrolysis. In the experimental work 21 dogs were used in the ticonium "wrought" group and the tissues were exposed to a total of 115 pieces of metal; the dogs were observed from two days to fourteen months. Seven dogs were used in the vitallium group; the tissues were exposed to a total of 34 pieces of metal and the dogs were observed from twenty-four days to fifteen months. In the ticonium "cast" with beryllium group, 14 animals were used; the tissues were exposed to a total of 55 pieces of metal, and the dogs were observed from fifty days to twenty-two months.

Results in the ticonium "wrought" group showed that all screws and plates were securely fixed and there was no corrosion. In the vitallium group, no evidence of toxicity was found; the screws were tight and the plates firmly fixed in the metal shank. The authors concluded that "wrought" ticonium and vitallium are essentially inert.

In the ticonium "cast" with beryllium group in which the dogs were killed before six months, the plates were firmly fixed and the screws tight, and the metal was bright and shiny. However, in the dogs which survived longer, these screws were usually loose and the tissues about the plates were discolored. Occasionally fluid was found about the metal. Thus ticonium "cast" with beryllium has been found to be cytotoxic.

Fibroblast cultures and electrolytic measurements were found to be inferior to histological studies as tests for the toxicity of metals, and it was shown that where the ticonium "cast" material was allowed to be *in vivo* more than six months, a toxic reaction took place.

RICHARD J. BENNETT, Jr., M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Gallagher, J. R., Gallagher, C. D., and Kaufmann, G. G.: Tetanus Toxoid Immunization of Adolescents. *N. England J. M.*, 1942, 227: 691.

Every physician at some time or other must choose between the dangers, discomforts, and horse-serum sensitization of tetanus antitoxin, and the possibility of tetanus following an apparently trivial wound. To help in solving the problem of tetanus prophylaxis, the authors studied the efficiency and unfavorable reaction of tetanus toxoid in a group of 500 boys who were given prophylactic doses of this substance.

The project was approached conservatively because of the frequency of unfavorable reactions from diphtheria toxoid in the adolescent age group. The results of the experiment clearly indicated that immunization with tetanus toxoid is a practical, safe, and very desirable procedure, and is satisfactory during adolescence, although immunization at an early age and in combination with the administration of diphtheria antitoxin appears to be the method of choice.

The boys, ranging from thirteen to nineteen years of age, were given 2 immunizing doses of the tetanus toxoid without the subsequent development of serious local or systemic reaction.

Strongly positive skin tests were reported in only 3.7 per cent of the group, and there is apparently little relation between a known previous allergic state and skin sensitivity to the diluted tetanus toxoid. Neither the skin sensitivity nor the history of previous allergic manifestations gave any reliable criterion on which to predict unfavorable local or systemic reactions, since only 4 of the boys of this entire group experienced unfavorable reactions.

STEPHEN A. ZIEMAN, M.D.

Casey, A. E.: The Incubation Period in Epidemic Poliomyelitis. *J. Am. M. Ass.*, 1942, 120: 805.

The incubation period (calculated from exposure to onset of the prodromal period) in 37 instances of epidemic human poliomyelitis varied from five to thirty-five days and averaged from twelve and two-tenths ± to one and one-tenth days. This is compatible with the incubation period in 11 cases taken from the literature and with the incubation period in the rhesus monkey or chimpanzee inoculated with freshly isolated human strains.

MARIAN BARNES, M.D.

Weed, L. A., Forney, R., and Carter, E.: Mechanism of the Reaction between Lecithovitellin and the Toxin of Clostridium Welchii. *War Med.*, Chic., 1942, 2: 960.

The following evidence is presented to indicate that the reaction between lecithovitellin and the toxin of clostridium welchii is due, at least in part, to some substance in the uninoculated broth which acts only within certain pH values, the growth of various organisms merely adjusting the acidity to the proper level:

1. Flocculation and turbidity do not occur if the toxin is neutralized to about pH 7.4. If the neutralized toxin is reacidified to the original value produced by the culture, the reaction again becomes positive.

2. Neutralization of the toxin to varying pH levels produces irregular reactions, even with known strains of clostridium welchii.

3. Acidity alone does not produce turbidity or flocculation of the lechithovitellin solution.

4. The reaction may be inhibited by any antiserum or normal human serum if the pH is elevated above the critical level for that particular medium.

The effect of heterologous antitoxins and normal human serum, the authors state, supports their contention that the lecithovitellin reaction is not due to clostridium welchii *per se*.

EDWIN J. PULASKI, M.D.

DUCTLESS GLANDS

Bartels, E. C., and Cattell, R. B.: Calcinosis Treated by Parathyroidectomy. *Ann. Int. M.*, 1942, 17: 859.

Subcutaneous calcinosis, a disease tending toward serious bodily disability, presents a most difficult therapeutic problem. It is usually the sequel to dermatomyositis or some inflammatory disease in the skin or subcutaneous tissue, and interferes with proper skeletal function by restricting the movements of muscles and tendons. The circulation of the skin and surrounding tissues may be disturbed and, at times, ulceration and infection may take place in the region of the calcium deposits.

Since the calcium deposits are usually considered to be fixed and the destruction of muscles and tendons irreparable, any type of treatment seems almost doomed to failure. Acid salts, such as ammonium chloride, have been used in an attempt to draw calcium from the deposits into the blood stream where it can be excreted normally. While this method seems rational, the results are usually disappointing. A successful result from producing a ketosis has been reported.

Ramsdall reported striking results in a young girl with calcinosis, following the production of tetany induced by unilateral parathyroidectomy. This plan of treatment has as its motive the mobilization of calcium.

The authors observed a boy of fourteen who had calcinosis of the subcutaneous tissue and muscles, associated with acrodermatitis chronica atrophicans secondary to dermatomyositis. When the patient was first seen there was marked restriction of the motion of the extremities and infection in the region of the calcium deposits. Treatment with a ketogenic diet, ammonium chloride, and desiccated thyroid for one year produced no apparent improvement. At the end of this time, unilateral parathyroidectomy was performed; this produced chronic tetany. No subjective symptoms of tetany developed, although a positive Chvostek sign was elicited. The serum phosphorus level became elevated and remained so for a period of eight months; the value for the serum calcium remained normal. During the two years since operation marked improvement has occurred, and roentgenograms demonstrate absorption of some of the calcium deposits. All the skin infections have healed, and the texture of the skin has improved.

The response of the serum calcium and phosphorus in this patient following parathyroidectomy suggests that the parathyroid glands are primarily involved with phosphorus excretion, and this accounts for the increase in the serum phosphorus level. The failure of the serum calcium level to fall may be explained on the basis that the mobilization of calcium from the calcium deposits in the subcutaneous tissue replaces that lost through urinary excretion. As the blood elements have returned to normal, no further clinical improvement is now anticipated by the authors.

EARL O. LATIMER, M.D.

EXPERIMENTAL SURGERY

Vaccaro, H., and Cabezas, J.: An Experimental and Clinical Study of Allergy to Catgut and the Production of Adhesions (Alergia al catgut y produccion de adherencias. Estudio experimental y clinico). *Rev. méd. Chile*, 1942, 70: 750.

Detailed protocols are given of experiments on rabbits and guinea pigs which show that a considerable percentage of these animals are allergic to catgut. Such a condition of allergy is doubtless responsible for the fact that a higher percentage of bad results is reported after the use of catgut than after the use of other suture materials. These results apply both to the early breaking down of wounds and the later formation of adhesions.

The practical conclusions to be drawn from the facts set forth are either that patients should be tested for allergy to catgut before operation, or that nonabsorbable suture materials that do not have antigenic properties should be used.

AUDREY G. MORGAN, M.D.

HOSPITALS; MEDICAL EDUCATION AND HISTORY

Soifer, M. E.: Discoverers (?) of Anesthesia: The Claimants. *J. Am. Dent. Ass.*, 1942, 29: 1601.

Soifer attempts to settle the question as to which of the three claimants was the true discoverer of anesthesia—Horace Wells, Crawford W. Long, or William T. G. Morton. The author narrates in detail the part that Horace Wells played in the discovery of anesthesia.

On December 10, 1844, Wells witnessed a public demonstration of the use of nitrous oxide for entertainment purposes. Noticing that one of the several young men who were volunteers for this experiment had hurt his ankle severely but did not complain of pain until the effects of the gas had worn off, Wells made inquiry of the demonstrator, Gardener Q. Coulton, as to whether this agent had ever been used for the painless extraction of teeth. When advised that it had not been so employed, he set about at once to use nitrous oxide to confirm his belief that human tissues could be rendered insensible to pain. Desiring to prove this at once, he hurriedly conferred with his associate, John M. Riggs, and arranged for Dr. Coulton to bring a bag of "laughing gas" to his office the next morning for the trial. Knowing little of the action of this gas, but willing if need be to risk his life to prove his theory, Wells in the presence of several witnesses permitted Coulton to administer the gas to him while Riggs removed one of Wells' molars. This experiment was a success and thus on

December 11, 1844, the use of nitrous oxide for the purpose of relieving the pain of dental operation was made known.

Wells immediately started to administer gas in his own practice for surgical operations. The fact was proclaimed at once, and after several weeks of trial Wells went to Boston to offer his discovery to a large medical group. From this date, until his death in 1848, Wells continued to employ nitrous oxide for dental and surgical operations. He discovered something which he demonstrated to the satisfaction of the laity and the profession, who unqualifiedly endorsed his claims. That he preceded Long and Morton in publishing his findings is simply a matter of chronological precedence; Long made public his discovery in 1849, and Morton applied ether in 1846.

About the time when Long first used ether, it was not uncommon to utilize this agent at select parties for entertainment purposes. In fact this use of the exhilarating properties of ether first turned Long's thoughts to its employment for the removal of a small tumor from the neck of one James Venable, on March 30, 1842. For the utilization of the anesthetizing ether on this and a few other occasions, the claim is made that Long discovered anesthesia. However, the author claims that the record shows that Long charged twenty-five cents for the administration of ether when no operation was performed, and is inclined to interpret this action with other observers to mean that Long continued to use ether for revenue and entertainment purposes only, and if he had realized the potentialities of ether for the relief of pain he would have published this fact in one of the many medical periodicals available at that time, and would have used every means known to inform the world that there was within his grasp this God-given blessing.

The author proposes to show that by Long's own admission, ten years after his use of ether, eight years after Wells' experiment with nitrous oxide, six years after Morton's successful application of ether to surgery, and four years after Simpson's use of chloroform in obstetrical practice, he (Long) did not think that he had discovered anything new.

William T. G. Morton witnessed the demonstration given by Wells in Boston on January, 1845, and was not impressed by its success. Early in the spring of the following year, however, Morton met a young woman who had recently had a tooth extracted by Wells under gas anesthesia. The report prompted Morton to visit Wells for questioning concerning the anesthesia. Morton was directed to secure the gas from a Dr. Jackson in Boston. Later conversations with Jackson brought out the advice to try ether. Morton procured a bottle of ether and tried it on the first available patient with such success that he set out to experiment with it further for operative purposes. Morton and Jackson then exploited the anesthesia commercially under a patent right.

By way of conclusion, the author summarizes the situation as follows: Crawford W. Long used ether in 1844; Horace Wells announced and demonstrated the principle of anesthesia in 1844 by the use of nitrous oxide; William T. G. Morton in 1846 advanced anesthesia through the use of ether for surgical operation in a public demonstration.

STEPEHN A. ZIEMAN, M.D.